The Chemical Age

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Canada—and Research

MR. VICTOR G. BARTRAM in his Presidential Address to the Society of Chemical Industry at last week's annual meeting at Exeter, modestly disclaimed any title to technical knowledge, but his address proved to be a remarkable account of the part that science is playing to-day in building up the industrial life of a great country that Britain is proud to number among the Dominions of the Empire. To many who stay at home, the Western Lands still speak in terms of the old settlers, the prospectors, the Gold Rush—a land of adventure and of pioneers. There is much of the pioneering spirit left in Canada to-day, but it is now the pioneering spirit of the chemist, the geologist, the business men starting new industries, improving older ones, avoiding waste, and building a new country with a planned economy that augurs well for a great future.

Canada is one of the richest countries in the world in terms of raw materials and potential wealth. Grain and agricultural products, paper, metals, coal and oil and water power are there in abundance—perhaps no one yet knows in what abundance. The tendency in opening up new fields has hitherto been to work the best and waste the rest. In Canada, scientific control is being introduced from the beginning and the strength of the country should in years to come be proportionally greater for the care that is now being exercised. In agriculture, Mr. Bartram pays tribute to the splendid work done by Canada's plant breeders and agricultural chemists in raising resistant stocks, in combating rust, on soils, on animal nutrition, on the qualities of wheat and other problems.

The foundation of the modern mining industry in Canada was laid with the setting up of the Government Geological Survey. Improved methods of mining and of ore treatment, with recovery of important by-products, have resulted from research. Copper, gold, nickel, base metals, are all there in abundance. A weak link in Canada's metal resources has been the low grade of the iron ore available; new discoveries of rich ore may well have removed this disability, and there is the process installed by British metallurgists in Germany for the utilisation of low-grade ores (not mentioned by Mr. Bartram) which may have a bearing on the subject. Paper is the greatest of Canada's manufacturing industries, and here again chemists have made great contributions to industrial progress, particularly in better methods of bleaching and digestion, in lowering sulphur consumption, and in more efficient recovery of process chemicals. Conservation of fisheries is another field for the scientific worker, and the staff that is employed by the Fisheries Research Board are permanently engaged in the practical problems of the fish and fish-handling industry.

It is not without significance for the distant future that Canada possesses one-sixth of the world's reserves of bituminous coal, that only Norway has a greater output of water-power per head, and that only the U.S.A. has a greater total annual output of water-power; electro-chemical industries use some 10 per cent. of all this power in the manufacture of carbide, cyanamide, ferro-alloys, in the electrolytic refining of metals and the production of caustic soda, chlorine, hydrogen and synthetic ammonia. Some 85 per cent. of the mechanical equipment of Canada's mines is operated electrically. It can surprise no one to learn from Mr. Bartram that "Canada is fast becoming an important factor in the world's chemical industry. Many of the principal chemicals being produced in Canada to-day have been developed on the American Continent by Canadian chemists." The list of these products given by Mr. Bartram is impressive in the extreme and reflects great credit upon Canadian chemists.

For the development of all these great industries peaceful co-operation between nations is essential in order that markets shall be available for the products that the skill of Canadian industrialists can produce from the abundance of raw materials available to them. Nevertheless, Mr. Bartram does well to remind the world that at the present juncture "Canada is looked upon with considerable interest as a country which has the necessary resources, man power and technical ability to develop further those chemical products which are so necessary to the well-being of the Empire."

It is in these times a very pleasant change to hear of a country which quietly gets on with the utilisation of its natural resources in the most profitable manner instead of loudly proclaiming the production of still further "substitutes" of doubtful practical value and at an uneconomic cost.

> *Though pure research in chemistry and physics is always interesting, even if regarded solely as natural philosophy, it is always the application to the needs of mankind which is the more spectacular, whether it be in the direction of alleviation of pain or disease, or in the production of more and better goods or goods with new properties.*
>
> —*F. C. Wood.*

NOTES AND COMMENTS

Last Month's Overseas Trade

ALTHOUGH the overseas trade returns for June are slightly less favourable than those of the preceding month so far as exports are concerned, they show a further expansion compared with a year ago. The gain was £3,002,000, or 8.1 per cent., to £39,895,256, and was spread widely throughout the different classes of manufacturing industry. On the import side, there was a gain of £5,634,000 (7.3 per cent.) and as there was a correspondingly large drop of £679,000 (13.6 per cent.) in re-exports, the visible adverse balance of trade was substantially higher on the month. Trade in the group of chemicals, drugs and dyes and colours showed expansion in both exports and imports over the corresponding month of 1938; exports increased by £524,186 to £2,240,180, and imports by £586,192 to £1,489,803. Re-exports showed a small fall of £569 to £40,926, compared with June, 1938.

The Bulgarian Chemical Industry

BULGARIA is primarily an agricultural country and the bulk of the country's supply of chemicals and allied products is imported from abroad to the extent of several millions of dollars annually, the American Consulate of Sofia reported recently. Most of the firms engaged in the manufacture of chemicals and allied products in Bulgaria are small, although soap, toilet preparations, alcohol and matches are produced in sufficient quantities to satisfy the local market. The plants making animal glue and the distilleries for rose oil and mint oil have an exportable surplus which is sold mostly in France, Germany and the United States. The production of chemicals and allied products in 1938 showed a general increase in almost all lines compared with the production in the two preceding years. Preliminary figures for some of the items made in 1938 were: alcohol, 100 per cent., 925,268 litres; matches, 52,880,000 boxes; acetic acid, 100 per cent., 45,000 litres; methanol, 10,000 litres; wood tar, 150 tons; bone glue, 600 tons; leather glue, 150 tons; glycerine, 550 tons; common soap, 10,000 tons; toilet soap, 1,000 tons; explosives, 400 tons; tartaric acid, 100 tons; rose oil, 1,690 kilograms, and mint oil, 40,000 kilograms. No new chemical plants were constructed in 1938, nor were any existing ones expanded to any extent. On the contrary the three plants manufacturing calcium carbide and one manufacturing copper sulphate have not been working for the last two years on account of the cost of local production. Complete statistics of imports of chemicals and allied products in 1938 are not available, but those of principal items imported showed increases over 1937 for the most part. In 1937, total imports of chemicals and allied products exceeded $6,000,000.

Indigenous Sources of Motor Spirit

IN general this country relies on sea-borne oil. Only when there is a real shortage of natural petroleum is the price of the products of the petroleum industry likely to rise sufficiently to make really extensive manufacture of oil from coal feasible as a primary operation. That other nations are examining their position is evident from negotiations which have proceeded for the erection of Fischer-Tropsch plants in various parts of the British Empire and in foreign countries and from the articles that appear in the technical press. An article in a recent issue of *Le Gaz* by M. Y. Mayor examines the position in France, with distinctly discouraging conclusions. Some 40 mil. tons of coal are carbonised annually in Great Britain; in France, coke ovens carbonise some 10 mil. tons and gasworks 4 mil. ton. The total production of benzole is more than 65,000 tons from coke ovens and 11,000 tons from gas undertakings annually. There is also produced a total of 716,000 tons of tar, of which 40,000 tons is used on the roads in the raw state, 460,000 tons as prepared road tar, most of the remainder being subjected to distillation. By subsidising the smaller gasworks, it is believed that benzole production could be increased to 100,000 tons. The tar oils could be hydrogenated—at a price. Nothing else can be done directly, but M. Mayor evidently is a firm believer in the use of gas for motor traction.

Use of Producer Gas for Traction Purposes

BEFORE the French gas industry could be interested in the home production of benzole or petrol, he maintains that the price of benzole must be maintained high enough to make it attractive to remove the benzole even in small works, that tar hydrogenation plants must be erected, and that an outlet must be assured for the coke. Given these measures, he visualises a much greater output of gas, part of which would be used directly when compressed in cylinders for driving motor vehicles for land transport, while the liquid hydrocarbons would be used for aviation—either directly or after hydrogenation. Wherever we turn in this oil-from-coal problem, we are faced with the cold blast of economics, and the conclusion that must be reached is that the problem can only be solved little by little. It may prove economic to increase the yield of benzole, or to hydrogenate the tar oils, or to use compressed gas for certain limited purposes; no grand solution involving wholesale replacement of petroleum products by gas and oil derived from coal is in sight. Yet, those who are aware of what is being done to develop producer gas for traction, made from anthracite or semi-coke, are becoming aware that a solution may be found in that direction.

Rest-Pauses in Industry

A DOCUMENT of unusual interest on the subject of rest-pauses and refreshments in factories has been issued by the National Institute of Industrial Psychology. The conclusions reached are based on personal interviews with responsible officials in 1,050 factories, employing about 305,000 workpeople. Equal numbers of factories were visited in seven industrial areas of Great Britain—London, Cardiff, Birmingham, Manchester, Leeds, Newcastle-upon-Tyne and Glasgow. A wide variety of industries and such non-factory activities as mining, building, transport and shipbuilding were included in the survey. The object of the inquiry was not to influence employers on the subject of rest-pauses, or to give advice, but simply to record the facts of existing practice, and to discuss the views of those who contributed to the inquiry. It was found that 52.9 per cent. of the factories visited made provision for official rest-pauses, either in the morning or afternoon. The percentages for the factories in the London, Birmingham and Manchester areas were notably high, and the report discusses the reasons for the lower percentages of other areas. More than half of the factories visited which have rest-pauses have introduced them during the past decade. The increase was particularly marked during 1938 owing to the introduction of new regulations in the Factories Act. Of those employers

who gave information relative to the effects of rest-pauses on efficiency 82 per cent. considered that the effects were good, while only 3.4 per cent. regarded the results as unfavourable. The report indicates, however, that properly organised rest-pauses are more frequently successful than others.

Official Recognition of Medicaments

IN his inaugural address to the British Phamaceutical Conference on Tuesday, Mr. J. Rutherford Hill, the chairman, said that there was need for some central authority to determine officially what were to be recognised as proper and reliable medicaments. The British Pharmacopœia was recognised as authoritative throughout the British Empire, but medicine and pharmacy were not national, but international; and to-day, more than ever, a Universal Pharmacopœia was needed. The medicaments in such a pharmacopœia would, of course, all be accepted as authoritative, he continued, and that would go a long way to settling the question of what are to be recognised as proper and reliable medicaments. He pointed out that medicine was a progressive science, and new drugs and methods of treatment were constantly being introduced. It was necessary, therefore, to have some standing authority with power to act and make recognitions and regulations as occasion arose. Mr. Hill further advocated the appointment of a Royal Commission to examine such problems as the sale of proprietary medicines, with a view to framing legislation that would bring the sale of all medicinal substances and preparations under control.

Business Enterprise Undaunted

IT is well known that one of the most remarkable features of present-day commerce and industry is its steadfast refusal to be harassed by fresh crises in the international sphere and the absolute correctness of its view has now been proved time and time again. While it is easily understood how an established business has determined to carry on as usual at a critical time, it is considerably less easily understood, and is indeed extraordinary, that business men have launched new enterprises to almost the same extent as previously. This surprising fact is brought out by figures compiled by Jordan and Sons, the company registration agents. Thus, in the first six months of this year 104 public companies were registered with a capital of £5,471,250, which compares with 108 companies with a capitalisation of £2,102,316 for the same period of 1938, 6,513 private companies were registered with a capital of £24,630,652 against 6,558 with a capital of £30,239,906. The figures speak for themselves and pay a high tribute to the level-headedness of the business man in troubled times.

The Chemical Age Lawn Tennnis Tournament

AT the kind invitation of the Associated Portland Cement Manufacturers, Ltd., the finals of the ninth annual CHEMICAL AGE Lawn Tennis Tournament will be held at the company's ground at Woodford Road, Snaresbrook, near Wanstead, on the afternoon of Saturday, September 16. Full particulars of the arrangements will be published at a later date.

Chemical Matters in Parliament

Mercury Bichloride

IN the House of Commons last week, the Parliamentary Secretary to the Board of Trade (Mr. Cross) moved the approval of the Additional Import (Key Industry) Duties (No. 1) Order, 1939. He said: "This Order relates to mercury bichloride which has been subject since 1921 to a duty of 33⅓ per cent. Under the Order it becomes liable to duty, at such a rate as with the Key Industry Duty will amount to 2s. per lb. The new rate is equivalent at the present value of imports—and those values are extremely low—to an *ad valorem* duty of a little more than double the previous rate. Mercury bichloride is used for pharmaceutical purposes as an antiseptic, in certain types of dry batteries, as a parisiticide for the treatment of wood, and for the manufacture of other mercury compounds. The United Kingdom has sufficient capacity to supply all our home requirements. Since 1937 there has been greatly increased competition from imports at very low average values. These have come particularly from Italy and in the course of the present year they have also come from Russia at even lower average values."

"The Italian exporters, I understand, have been able to get supplies of mercury, and mercury is the principal component and the most costly component in mercury bichloride, at prices lower than the world market prices which have been paid by United Kingdom manufacturers. Indeed this has gone to such a length that the c.i.f. value of the imports in many cases has been less than the cost to the United Kingdom manufacturers of the mercury content alone. As a consequence of this competition the United Kingdom share of the home market and the volume of our export trade have both been greatly reduced. The duty on the recent values of imports is on a reasonable level, despite the fact, which I have already indicated, that it would be something more than twice the 33⅓ per cent. which obtained in the past. The 2s. duty added to the import value of mercury bichloride would bring the total import value up to 4s. 6d. per lb. and that compares with the United Kingdom schedule price of from 4s. 10d. to 5s."

After debate the question was put and agreed to.

The Trafford Chemical Co.

Mr. Ellis Smith, in the House of Commons on Tuesday, asked the President of the Board of Trade: (1) from which country the specialists and chemists came who had been engaged at the Trafford chemical factory during the last 12 months; where it was intended that the chemists should be engaged from in the future; where the bulk of the machinery had been obtained; and whether he was satisfied with the efficacy of the arrangements; and (2) what the arrangements were between the I.G. Farbenindustrie A.G. and the Imperial Chemical Industries in the Trafford Chemical Co.; would the arrangements in any way affect firms outside the cartel arrangements; and would firms be affected who manufactured dyestuffs and those products for which the licence had been stopped under the Dyestuffs Act.

Mr. Oliver Stanley, in replying to the question regarding the operation of the Trafford Chemical Co., referred to the reply he gave to the hon. member on June 13. (See *C.A.*, June 17, p.450). He continued: I have received no representations in the matter from other dyestuffs manufacturers in the United Kingdom, and I see no reason why the establishment of a company devoted primarily to the manufacture of speciality dyestuffs hitherto imported should prejudice the interests of other makers. The company has not yet started manufacture, but I understand that it is the intention to engage a small number of German technical experts and that some of the machinery will be imported from Germany.

Replying to a further question, Mr. Stanley said: Certainly I regard the establishment in this country of the manufacture of speciality dyes for which up to now we have been obliged to import from abroad as very much in the national interest.

OIL FROM COAL

Production by the Fischer-Tropsch Process

THE long history of the development of hydrogenation represented in England by the magnificent work of I.C.I. in their great plant at Billingham, together with the corresponding work which has been done in Germany, show us clearly what the history is of such a highly scientific process, said Col. K. C. Appleyard at a meeting of the Midland section of the Coke Oven Managers' Association. It is equally clear to those who have studied the problem that there is no possibility of these processes yet becoming economic in the true sense of the word.

Reasons for Oil from Coal Production

It may be asked why we should consider it necessary to produce oil from coal in this country by processes which, at the moment, cannot be described as other than relatively expensive. The reply to this question can be summarised under four headings. *viz.* :—

(1) A shortage of oil would place the fighting services and munition works in a very serious position in the event of a serious national emergency.

(2) The coal industry would be greatly stimulated by the production in this country of any appreciable proportion of the oil needed annually. For example, to produce the 10 mil. tons of oil needed annually we should require an additional quantity of coal amounting to some 40 to 50 mil. tons, a quantity that would constantly increase as our oil consumption grows.

(3) The reserves of natural oil are not inexhaustible, and although there is no immediate indication of supplies diminishing, it is desirable that some alternative sources of oil should be available.

(4) Although the present cost of production of oil from coal is relatively high, it can confidently be expected that with increased output, cheaper and cheaper methods of production will be found by technical improvements in the processes and increased efficiency of operation. Such diminution in cost is already seen in the production of synthetic ammonia and in the development of the hydrogenation process from what was, to commence with, more or less a scientific experiment.

The Fischer-Tropsch process has developed as a result of laboratory research into pure chemistry. Nearly 40 years ago Sabatier and Senderens found that if oxides of carbon, mixed with hydrogen, were passed over reduced nickel at temperatures between 200° and 250° C., the following basic reactions occurred :—

$$CO + 3H_2 = CH_4 + H_2O$$
$$CO_2 + 4H_2 = CH_4 + 2H_2O$$

Influence of Operating Conditions

It was found that a number of factors affected the way in which the reaction would go. For example, increase of temperature favours the formation of permanent gas, *i.e.,* of the less complex substances. If Sabatier and Senderens had worked at a somewhat lower temperature they would have obtained liquid hydrocarbons in place of methane. It was not, however, until Professor Fischer and his collaborators, especially Dr. Tropsch, carried out their researches shortly after the war, that it was discovered possible to make these liquid products. One reason for this delay in ascertaining these conditions is the fact that when Fischer and Tropsch commenced their work, catalysts of considerably greater activity were available than those produced in 1902. Without such catalysts the reactions now observed at temperatures around 200° C. would not take place.

The Fischer-Tropsch experiments, moreover, were favoured by the use of furnaces constructed by themselves which permitted the maintenance of the reaction temperature constant to within a fraction of a degree. Such accurate temperature control is of very great importance in these synthetic reactions.

In the early experiments of Fischer, carbon monoxide and hydrogen were made to react together over alkaline iron catalysts, at a temperature of 400° C. With the production of oxygenated compounds such as methyl alcohol (synthol) it was found that with decreasing pressure the formation of hydrocarbons and of an oil which resembled petroleum in its general properties, took place. As a result of these experiments, it was inferred that petroleum hydrocarbons could be synthesised from a mixture of carbon monoxide and hydrogen at low or even at atmospheric pressures, providing that suitable catalysts could be found.

In 1925 this actual reaction was confirmed and light aliphatic hydrocarbons were produced. The principal catalysts used up to that time were iron and cobalt, the iron being activated with copper and a little alkali, and the cobalt with zinc oxide. Experiments were carried out using nickel as a catalyst, but these were at first unsuccessful until a technique was discovered which enabled nickel catalysts to function as well as cobalt catalysts.

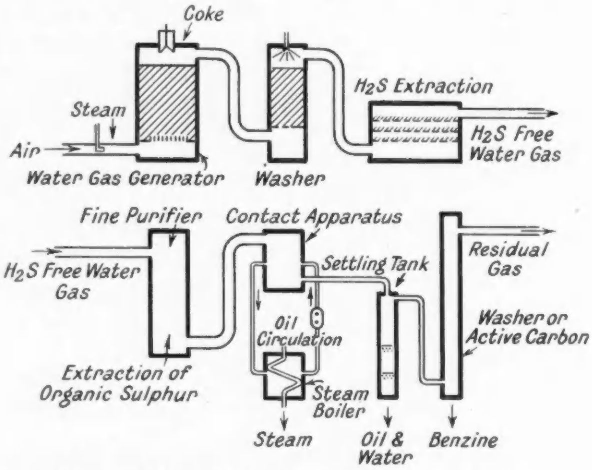


Fig. 1. Diagram of the Fischer-Tropsch process.

It was soon realised that the composition of the basic gaseous mixture must be varied to suit the catalyst used. For example, with iron, carbon monoxide and hydrogen should be in the proportion of 1 : 1, and with cobalt preferably in the proportion of 1 : 2. When using these highly active catalysts it was essential to free the gas completely from sulphur whether in the form of sulphuretted hydrogen or organically combined.

The temperature at which the reaction was conducted depended largely upon the type of catalyst used and also upon the composition of the gas mixture. With iron, for example, the temperature should be as high as 250° C., but with a cobalt catalyst no higher than 180° to 200° C. The higher the percentage of hydrogen the lower is the temperature at which the reaction should be effected.

A very important factor in the maintenance of the correct temperature is the heat of the reaction. The synthesis of light hydrocarbons, which may for convenience be designated by the formula (CH_2), is shown by the following equation :—

$$CO + 2H_2 = (CH_2) + H_2O + 48{,}000 \text{ cals.}$$

From this thermal equation it is seen that for every 1 cu.

cm. of the reaction gases introduced into the apparatus approximately 600 kg. cals. are developed—a quantity of heat which would be sufficient to raise the temperature of the gas by many hundred degrees Centigrade. Means must, therefore, be introduced into the catalysis apparatus for the dissipation of this heat. This is the more necessary since, to obtain the best results the temperature must be rigorously maintained with narrow limits.

Increasing temperature combined with increased pressure promotes the formation of oxygenated compounds, *e.g.*, alcohols. The following table shows the influence of the operating conditions upon the products of the synthesis.

Influence of operating conditions upon the products.

	Operating Condition	Preferential Product
1.	Increasing pressure	Alcohols.
2.	Increase of hydrogen in reaction gases	Methane—on account of increasing saturation, unless the temperature is lowered.
3.	Decrease of hydrogen in reaction gases	Olefines.
4.	Increasing temperature	Methane and carbon.
5.	Catalyst metal in the order: Fe-CO-Ni	Increasing saturation, therefore less olefines.
6.	Presence of CO_2	No influence.
7.	Increase in age of catalyst	Increase in benzine yield at the expense of heavy oil.

The gas used for the production of liquid fuels by the Fischer-Tropsch process consists essentially of a mixture of one volume of carbon monoxide with two volumes of hydrogen. This gas can be produced in a number of ways and from a number of fuels. For example, with coke as the starting point, the coke can be made into water-gas containing approximately 40 per cent. of carbon monoxide and 50 per cent. hydrogen. In order to adjust the proportion of hydrogen to the required figure, roughly one-quarter to one-third of the gas is isolated and is converted into hydrogen and carbon dioxide by means of the catalytic combustion of carbon monoxide with steam, according to the reaction—

$$CO + H_2O = CO_2 + H_2$$

The carbon dioxide is extracted by water under pressure and the hydrogen is added to the residue of the original gas. In this way a synthesis gas is obtained containing about 30 per cent. of carbon monoxide and 60 per cent. of hydrogen.

Coking Coal as Source of Synthesis Gas

If coking coal is used as the starting point, the coal is converted into coke, which is then used for the manufacture of water-gas, the small coke being used for the generation of steam and the coke oven gas being cracked in a special unit, in order that the methane may be converted into a mixture of carbon monoxide and hydrogen according to one of the following two equations:—

$$\text{(a)}\quad CH_4 + H_2O = CO + 3H_2$$
$$\text{(b)}\quad CH_4 + CO_2 = 2CO + 2H_2.$$

One of the advantages of the Fischer-Tropsch process is the flexibility which obtains with regard to the various raw materials available.

For the Fischer-Tropsch process, it is essential that the synthesis gas should be stripped as completely as possible of sulphur, both in the form of hydrogen sulphide and also organic sulphur compounds. The hydrogen sulphide is removed either by means of oxide boxes, as in normal practice, or by the Thylox process, while the organic sulphur compounds are removed by passing the gas through a special catalyst mass which reduces the amount of sulphur to not more than 0.086 of a grain per 100 cu. ft. This problem of the absolute purification of the reaction gases from sulphur was, for a long time, a stumbling block to the industrial application of the process and its complete solution is a matter of the first importance.

The Most Suitable Catalysts

The most suitable catalysts—iron, cobalt and nickel—have the common property of being able to form carbides of the general formula Me_3C. Other carbides than this have not been proved to exist, but it is possible that these carbides take part in the reaction, somewhat in the following way:—

$$2H_2 + CO + Co_3C = Co_3C_2 + H_2 + H_2O = Co_3C + (CH_2) + H_2O$$

Experiments have been carried out with catalysts consisting of iron, copper and manganese deposited on silicagel, iron and copper on kieselguhr, nickel-thorium mixtures on kieselguhr, nickel-manganese-aluminium on kieselguhr and various mixtures of cobalt, thorium, manganese, nickel and copper. Of all these materials it was found that a cobalt-thorium catalyst precipitated on kieselguhr gave the maximum yield of liquid products with simultaneous maximum life.

In spite of what has been said above, the Fischer-Tropsch process has recently been operated at pressures around 10 atmospheres. In this way, an increased yield of about 25-30 per cent. has been obtained, mainly due to an increase in the paraffin yield. This operation is now known as "Medium pressure synthesis," and the gas used, as also the contact material, is exactly the same as for normal pressure synthesis. Below a pressure of 20 atmospheres there is no appreciable formation of oxygenated compounds, such as fatty acids. With the medium pressure synthesis, the catalyst has a considerably longer life than with the normal pressure operation and, in fact, the life may be as much as seven times as long. The products obtained by this new method are not used direct either as motor or Diesel fuels, but are subjected to cracking or polymerisation by well-known and existing methods.

Attention has already been drawn to the fact that the Fischer-Tropsch reaction is exothermic, and one of the main problems has been the dissipation of the heat generated by the reaction. Many types of reaction chambers have been tested before the final design was adopted, and in the apparatus finally agreed upon, the catalyst is arranged between hollow spaces through which a stream of water flows which can be regulated to maintain constant temperatures. If medium-pressure synthesis is practised, the catalyst is situated inside vertical tubes, these being cooled by water which

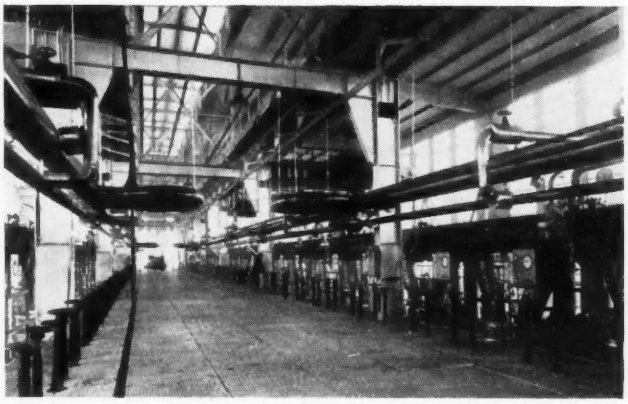


Fig. 2. An interior view of the contact chamber house.

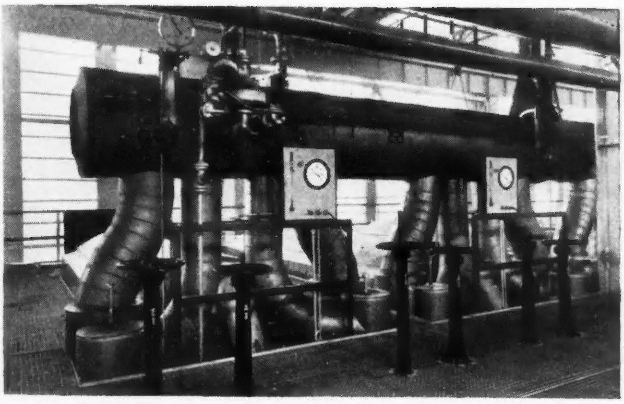


Fig. 3. A group of contact chambers with valves and steam collector.

passes outside the tubes, and which is converted directly into steam.

A flow-sheet of the process is shown in Fig. 1, from which it will be seen that the coke is fed into a water-gas generator, the water-gas is scrubbed with water to remove dust, and then through an oxide bed to remove hydrogen sulphide. From this oxide bed the gas passes into the fine purifier, where the organic sulphur is removed by means of the special catalyst mass until the gas contains a maximum of 0.086 of a grain per 100 cu. ft. The warm gas enters the reaction chamber in which the synthesis occurs and wherein the predetermined optimum temperature of approximately 190° C. is maintained with precision. The high heat of reaction which represents up to 20 per cent. of the heat of combustion of the gases, is removed by the water passing through the hollow spaces arranged within the contact furnace, and this is converted into steam. The volume of gas leaving the contact apparatus at atmospheric temperature is some 20-25 per cent. of that of the gas entering. The degree of contraction is a measure of the percentage conversion which is being effected. The higher boiling portions of the oil, together with the soft paraffin wax and the water of reaction, are deposited by cooling the gas to atmospheric temperature. The petrol fraction, together with the light condensable hydrocarbons, such as propane and butane, are abstracted by passing the gas through chambers filled with activated carbon. In the medium-pressure synthesis, however, this fraction is recovered by scrubbing with oil under pressure.

The actual contact chambers which are arranged in batteries, are shown in Fig. 2. This shows a view in a contact chamber house with the contact chambers arranged on the right and left of the main platform, shown in the centre of this picture. This is the heart of the plant, and the various chambers are each provided with a suitable range of instruments for indicating the inlet and outlet temperature of the oil for maintaining constant temperature of the mass and other factors while gas analyses are carried on at one central point halfway along the house.

Fig. 3 shows two contact chambers with their fittings and instruments and with the vapour collecting ducting.

It will be obvious that since the products are produced from gases which have been freed from dust and almost entirely from sulphur, they will be of a very good colour and will be almost sulphur-free. All that is needed before placing these products on the market is to free them from traces of organic acids and to fractionate them into the various ranges desired. The products naturally vary in character and in proportion according to the catalyst employed and the composition of the reaction gases.

The boiling range of the primary oils obtained by condensation and washing will also depend upon the type of catalyst used. Theoretically, 180 grams of oil can be produced from 1 cu. m. of gas containing 29 per cent. CO and 58 per cent. H_2. In actual practice a yield of approximately 125-150 grams per cu. m. is being obtained, corresponding to approximately 79 per cent. yield. The formation of methane can be almost wholly suppressed, but some permanent gas is left as residual gas from the process. This is used for steam raising or other purposes.

The proportion of the various fractions obtained under certain conditions, is as follows :—

Distribution of primary products when using cobalt catalyst.

		Boiling Limits	Percentage in Weight
1.	Light condensable hydrocarbons ..	Under 30° C.	8 per cent.
2.	Benzine	30 to 200° C.	50 ,,
3.	Diesel oil	Over 200° C.	39 ,,
4.	Soft Paraffin	Melting point over 50° C.	3 ,,
			100 ,,

In addition to the products shown above, hard paraffin having a melting point of over 100° C., is recovered from the contact mass, and this hard paraffin amounts to roughly 3 to 4 per cent. of the primary products. It is a hard wax of excellent quality, having a high insulating power and is, of course, water-white. The condensable hydrocarbons consist mainly of propane-butane mixtures.

The most important constituent, *i.e.*, the petrol, is subjected only to a caustic soda wash to remove traces of organic acids. After distillation to remove the heavy constituents, it has the following characteristics, the figures quoted being obtained by distillation conducted in an Engler flask :—

Characteristics of motor spirit produced from the primary products of the Fischer-Tropsch process.

Up to 60° C.	7·0 Vol. per cent.
,, 80° C.	24·0 Vol. ,,
,, 100° C.	43·0 Vol. ,,
,, 120° C.	52·5 Vol. ,,
,, 140° C.	65·0 Vol. ,,
,, 160° C.	76·0 Vol. ,,
,, 180° C.	87·0 Vol. ,,
Specific gravity	0·70/15 C.
Octane number	55

The octane number of the Fischer-Tropsch motor spirit is similar to that of straight petrol as would be expected from the similiarity in composition. Its octane number can, of course, be increased either by admixture with benzole or by the addition of lead tetraethyl. The addition of 1 cu. m. of tetraethyl lead per litre has been shown to increase the octane number of the spirit boiling up to 180° C., by 24.5 units.

The fraction boiling over about 210° C., provides an excellent Diesel oil when the dissolved paraffin has been removed. It is found to have excellent combustion properties and gives a clear exhaust even with a considerable overload on the engine, while its high hydrogen content enables it to be used with a better fuel consumption than petroleum Diesel oil.

Lubricating oil can be manufactured by a by-product of the Fischer-Tropsch process, by polymerising the fractions containing olefines with anhydrous aluminium chloride. Alternatively, high boiling fractions, low in olefines, can be chlorinated to produce mono- or dichloro-derivatives, these oils being subsequently caused to polymerise and simultaneously being dechlorinated by finely divided metallic aluminium. It has now become possible to produce lubricating oils possessing the most varying properties. They are adjustable to such an extent that lubricating oils suitable for any purpose whatsoever can be produced synthetically.

Essence of Lavender

Criticism of Limiting Characteristics Required by French Authorities

FROM A SPECIAL CORRESPONDENT.

STUDIES carried out on true essence of lavender in France tend to show that some of the characteristics required by the French Service des Fraudes are excessive. At the present time the tests of the Service des Fraudes for a true, unadulterated essence of lavender are: Dry extract, less than 3 per cent.; refractive index of the lighter fractions, obtained at the beginning of distillation, greater than 1.4700; it should contain ketones in the first and last fractions of the distillate, with a content of about 1 per cent. in the first 50 per cent. of the distillate; and maximum ketone content in the first 5 per cent. of the distillate, 9 per cent.; and camphor should be absent.

Examining specially prepared essences, Crabalona found that certain true essences have a refractive index in the first part of the distillate which is nearer to 1.4650 than the 1.4700 required by the Service des Fraudes. Cases were also found in which the ketone content of the first 5 per cent. of the distillate was clearly in excess of 9 per cent. Examining the reasons for these discrepancies, Crabalona points out that the method of distillation used by the Service des Fraudes in determining its requirements fails to allow for the retention of some of the more volatile constituents of the essence, notably of ethyl-*n*-amylketone. Moreover, closer examination of freshly prepared essences of lavender showed that they contain traces of camphor, though these generally disappear in essences after a time.

Practical Data in Plant Design

By
"ENGINEER"

IF plant is to work smoothly it must obviously be of a capacity suitable for the different factors which are involved, including not only the amount of the charge at each point, but also from the aspect of such variables as temperature exchange, the retention of conditions of pressure or vacuum, and the flow of materials whether they be liquids, gases or solids. The trouble in general design, however, is sometimes a matter of not knowing just where to start in the absence of sufficient basic data, and here the only alternative course is to utilise the accumulated experience of previous practice. Just how much material has to be handled, so far as affects the capacity of a plant, it is easy to set down in accordance with manufacturing proposals. But in the absence of definite data on a quantitative experimental basis, or in the absence of a small-scale plant to show the difficulties which may arise in practice, basic data can be somewhat hazy. At the outset, therefore, the value of practical data suitable for approximations is not to be rejected, for any such data help considerably in pointing to the line of development and can be conveniently correlated with theory at each stage of the precise calculations. Such data are distributed widely in technical papers which have been read before the leading societies and duly published, and also in authoritative monographs, but this data have to be gathered together for ready use as and when the opportunity occurs.

In the absence of better information as to conditions which will arise and a knowledge of the means for making precise calculations, the data gained by actual operation of plant, although somewhat approximate in nature, can be better than nothing at all—even if their accuracy must be the subject of comment. Let it be remembered that even after precise calculations have been made, it is often still necessary to make allowance in the form of a factor of safety.

Examples of Practical Data

In the matter of the heating and evaporation of liquids, for instance, the use of a copper coil, with steam at a gauge pressure of 40 to 60 lb. per square inch, allows an evaporation of 20 lb. of water per hour per square foot of heating surface to be expected in the absence of any unusual circumstances; this figure relates to actual evaporation and does not include the preliminary heating of the water to the evaporation point. This evaporation rate is equivalent to a transmission of about 19,000 B.Th.U. per hour per square foot of evaporating surface, or from 260 to 200 B.Th.U. per hour per square foot per degree F. temperature difference for steam and water, the latter being at 212° F. Using the same coil and the same steam pressure, from 160 to 240 lb. of water may be heated per hour from an initial temperature of 50° F. to evaporation point at 212° F. for each square foot of heating surface, when the water is not specially moved or agitated. This is equal to a transmission of 26,000 to 39,000 B.Th.U. per hour per square foot of heating surface.

Regarding coils for condensing and cooling, in the case of petroleum oils from 1 to 3 square feet of iron condenser surface may be considered necessary per gallon of distillate per hour, the latent heat of the oils ranging from 110 to 150 B.Th.U. per lb. and the specific heat being taken at 0.5. For kerosene the condenser surface has been conveniently calculated at 1.3 to 1.5 square feet per gallon of distillate per hour; for naphtha, at 1.7 to 2.0 square feet per gallon per hour. In both cases the distillate is assumed to be cooled to 60° F. Upon solvent recovery plant about 2 square feet of copper condenser service is provided per gallon of distillate per hour, when handling petroleum spirit of latent heat 130 B.Th.U. per lb. and specific heat 0.4. If the water enters the condenser tank at 50° F. and leaves at 100° F., about 3 gallons of cooling water will be required per gallon of spirit.

Where steam is used as the heating medium, the steam requirements of tubular air heaters may be approximated at an allowance of 1 lb. of steam for each 3,000 lb. of air demanding a temperature rise of 1° F. This figure is applicable for steam pressures up to 5 lb. per square inch. Measured at 60° F. 3,000 lb. of air is roughly equal to 40,000 cubic feet. In a similar tubular heating system where hot gases are flowing on the outside of the tubes in an unlagged cylindrical shell, the heat dispersed by radiation is 20 to 25 per cent. of the heat transferred by the walls of the tubes. This brings us to the subject of radiation losses from bare steam pipe, for which about 3 B.Th.U. per hour per square foot of exposed surface should be allowed for each degree F. difference of temperature for the steam in the pipe and the surrounding air. Radiation losses from bare sheet iron casings may also be considered as an example of practical data. About 1.9 B.Th.U. per hour per square foot of surface per degree F. temperature difference is allowable when the temperature difference is 50°; this increases to 2.1, 2.4 or 2.7 B.Th.U. when the temperature difference becomes 100°, 150° and 200° respectively.

Waste from Leakage

With regard to leakage from pipes and vessels, it is well to remember that a hole one thirty-second of an inch in diameter will pass 4,790 lb. of steam per month at a pressure of 160 lb., the total cost of the waste being considerable if much leakage develops at this rate. The respective figures for an orifice $\frac{1}{8}$ and $\frac{1}{4}$ inch diameter would be 19,280 and 74,650 lb. per month. In the case of compressed air the 1/32 inch hole would waste 52,910 cubic feet of air per month at a pressure of 75 lb. per square inch; for water at 60 lb. pressure, there would be a waste of 5,990 gallons per month.

Drying practice as carried out in tunnel dryers and drying chambers also provides much useful data. The volume of air required may be calculated at an equivalent allowance of 60,000 cubic feet of air dropping 1° F. for each lb. of moisture to be evaporated and removed, the wet material being assumed to enter the dryer at 60° F. This figure refers to dry air measured at 60° F. as it enters the heater, and may be used with an error of less than 2 per cent. for all cases where the hot air ultimately enters the dryer within the temperature range 120°-240° F. The volume of air required for heating the "dry substance" of the charge in a tunnel dryer, from the temperature at which wet material enters to that at which dried material leaves, may be calculated at the equivalent allowance of 55 cubic feet of air dropping 1° F. for each B.Th.U. demanded.

A still for crude carbolic acid, having a capacity of 1,100 to 1,700 gallons has been found to need a heating surface of 85 to 110 square feet, with steam pressure at 6 to 8 atmospheres. Operation in conjunction with a ring-filled fractionating column, 24 inches diameter and 20 feet high, demanded the provision of a reflux condenser surface of 86 square feet of wrought iron, and a final condenser surface of 42 to 54 square feet of iron (or 21 to 27 square feet of copper), about 4,400 gallons of cooling water being used per hour. In the case of similar equipment for crude petroleum spirit, a still of 4,000 gallons capacity, using 60 lb. steam pressure, required a heating surface of 40 square feet, and the fractionating column was 30 inches diameter and 45 feet high. Here, 100 square feet of iron reflux condenser surface was provided, with 120 square feet of iron for the final condenser. Cooling water to the amount of 4,000 gallons was required per hour, for a distillation rate of 300 gallons.

Centenary of the Discovery of Vulcanisation

American Chemical Society's Celebration

CELEBRATION of the centenary of the discovery of vulcanisation of rubber by Charles Goodyear will be a chief event of the ninety-eighth meeting of the American Chemical Society, which, it is announced, will be held in Boston, September 11 to 15. Dr. James Bryant Conant, president of Harvard University, and holder of the William H. Nichols Medal of the New York Section of the Society for achievement in chemical research, has been appointed honorary chairman of the convention committee. Dr. Gustavus J. Esselen, president of Gustavus J. Esselen, Inc., and a director of the Society, has been appointed general chairman.

Executives of leading industrial corporations and educational institutions will deliver addresses at a special Goodyear centenary programme on Wednesday, September 13, when numerous papers describing the progress of rubber research and manufacture in the United States will be read at a general meeting in the afternoon and at a dinner meeting in the evening.

The evening speakers and their topics are: W. S. Knudsen, president of General Motors Corporation, "What the Rubber Industry Has Meant to the Automobile Industry"; P. W. Litchfield, president of Goodyear Tire and Rubber Company, "The Rubber Industry"; Dr. Karl T. Compton, president of Massachusetts Institute of Technology, "Vulcanisation from the Physicist's Standpoint"; Dr. Conant, "Vulcanisation from the Chemist's Standpoint."

Speakers in the afternoon will be as follows: E. B. Babcock, chief chemist of the Firestone Tire and Rubber Company, "What is Vulcanisation?" A. B. Newhall, executive vice-president of the B.F. Goodrich Rubber Company, "Work of Thomas Hancock"; R. W. Lunn, managing director of the Leland and Birmingham Rubber Company, "Work of Charles Goodyear"; W. A. Gibbons, director of research of the United States Rubber Company, "The Rubber Industry Since 1839."

A Symposium on Vulcanisation will be held on Thursday, September 14, under the auspices of the Society's Division of Rubber Chemistry, the chairman of which is George K. Hinshaw of the Goodyear Tire and Rubber Company. Thirteen other divisional symposia are scheduled during the five-day meeting.

Waterproof Paper

Incorporation of Artificial Resins in the Pulp

OSKAR LANG, in French patent No. 834,220, describes a process for the manufacture of papers which are impermeable to water or to greases by adding artificial resins to the paper pulp, the resins being added in the form of emulsions with softening agents if necessary. The resins are precipitated on the fibres of the pulp by addition of electrolytes and the pulp is passed over hot callenders without vulcanising agents. A wide range of plastics can be used, the butadiene polymers, notably Buna, Baerit or Thiokol, being preferred. Vinyl ester polymers, polyvinyl alcohols, and acrylic acid polymers can also be used.

In an example, a mixture of 100 parts of dry cellulose with 5 to 10 parts of artificial rubber in aqueous emulsion, with diethyl phthalate, is prepared and a 10 per cent. solution of aluminium sulphate is added in sufficient quantity to introduce 5 parts of sulphate to 100 parts of cellulose (dry). This precipitates the rubber on the cellulose fibres. Manufacture of the paper is then carried on in the usual manner, the only special requirement being that the callender should be heated to about 120° C. This softens the rubber sufficiently to permit it to be pressed into the pores between the fibres, producing a paper which is impermeable to water, air and greases as well as being very flexible and elastic.

Carbon Disulphide Vapour

Its Detection in Industry

LEAFLET No. 6 in the series issued by the Department of Scientific and Industrial Research on methods for the detection of toxic gases in industry deals with carbon disulphide vapour (published H.M. Stationery Office, 3d. net). The situations where this vapour may occur in dangerous concentrations include works where the following are manufactured: Artificial silk (viscose), chemicals, coal gas, vulcanised and "dipped" rubber goods, and tar distillation products.

In high concentrations it may cause delirium, coma, and death from respiratory failure. The better known effects, however, are those of a severe chronic poisoning of the nervous system with a great variety of symptoms, varying in degree from slight fatigue and giddiness to serious mental derangement, blindness, and paralysis. It is stated that the permissible concentration of carbon disulphide vapour in the atmosphere of workrooms should be kept well below 1 part in 30,000 of air, and preferably not above 1 part in 100,000.

The standard method adopted for the detection of low concentrations of carbon disulphide vapour in industry depends upon its interaction with diethylamine and copper acetate, to produce a coloured compound, copper diethyldithiocarbamate.

A series of standard colours is first made up by the addition of small quantities of the reagents to dilute alcoholic solutions of carbon disulphide of known strength. Samples of the air under test are then drawn, by means of a hand-pump of definite capacity, through a bubbler of alcohol containing the reagents, and the mixture allowed to stand. The colour developed is compared with the series of standards, and from the number of pump strokes made and of the colour obtained, the concentration is estimated by reference to a table. Concentrations down to 1 part in 120,000 can be estimated in this manner with 20 strokes, or less, of the pump.

Any traces of hydrogen sulphide in the atmosphere will also produce a colour with the reagent. These can, however, be removed (if not more than 1 part in 10,000) by drawing the air sample first through a filter paper impregnated with lead acetate. Full instructions for carrying out the tests are contained in the leaflet.

NEW LOCAL ANÆSTHETICS

A series of substituted benzoic esters of β-(2-piperidyl)-ethanol was prepared by Walter and Fosbinder (*J.Am.C.S.*, 1939, *61*, 1713) by refluxing one equivalent of the hydrochloride of the amino alcohol with one equivalent of acid chloride in dry chloroform. The amino ester hydrochlorides were purified by crystallisation from absolute alcohol or from absolute alcohol-ether mixture. The N-phenylurethan and the cinnamate were prepared similarly from phenyl isocyanate and cinnamoyl chloride, respectively. The hydrochlorides of the nitro esters were reduced to the amino compounds with platinum and hydrogen in glacial acetic acid. Pure β-(2-pyridyl)-ethanol is best prepared by heating α-picoline with twice its weight of 40 per cent. formaldehyde in a sealed tube at 120° for sixteen to twenty hours. The mixture is then fractionally distilled at a pressure sufficiently reduced so that the temperature of the mixture never rises above 130°. The yields are only 15 to 20 per cent. but the product is not contaminated with the β-(2-pyridyl)-allyl alcohol which is formed by dehydration of β-(2-pyridyl)-propylene glycol at higher temperatures. Some of the latter compound is formed from two moles of formaldehyde and one of picoline even at 120°.

The pyridyl alcohol was reduced to the piperidyl alcohol with sodium and absolute alcohol.

All the compounds are nicely crystalline and non-hygroscopic without exception. Preliminary investigation has indicated that they are useful local anæsthetics.

British Association

Programme of the Chemistry Section at the Dundee Meeting

THE proceedings of Section B (Chemistry) at the Dundee meeting of the British Association, August 30 to September 6, will begin with the presidential address by Professor E. K. Rideal on "Film Reactions as a New Approach to Biology," and the rest of the day (August 30) will be devoted to a joint discussion with Section I on "Tissue Respiration," to be opened by Professor R. A. Peters. Dr. Malcolm Dixon will deal with catalysis in tissue respiration (catatorulin) and Dr. H. Theorell (Stockholm) with with the flavoproteins. After an account of cytochrome and similar compounds by Professor D. Keilin, Dr. F. Dickens will consider the interpretation of intermediary metabolism from measurement of tissue respiration, and Dr. J. H. Quastel that of narcosis. Dr. S. Ochoa will deal with carbon dioxide evolution and cocarboxylase. Professor H. S. Raper will discuss the control of tissue respiration, and other aspects of the subject will be presented in discussion by Dr. D. E. Green, Sir F. Gowland Hopkins, Dr. H. A. Krebs, Dr. T. Mann and Dr. E. P. Poulton.

A discussion on "Light Alloys" will be opened by Dr. C. H. Desch, who will speak of their growing importance and will refer in particular to their mechanical strength and to their resistance to corrosion. Dr. A. G. C. Gwyer will discuss the constitution of aluminium alloys and Mr. W. C. Devereux will describe the controls of production of light alloys, including spectrographic analysis and the X-ray control of their thermal and mechanical treatment. Their industrial uses will be dealt with by Professor A. von. Zeerleder. An exhibition illustrating the uses of light metals and alloys, with a research section, will be open throughout the meeting.

Progress in Physical Chemistry

Progress in physical chemistry is largely dependent on the development of new technique. Not only does such technique help to solve specific problems unassailable by the older methods, but it also opens up entirely new lines of investigation. This topic will form the subject of a discussion in which new methods and their bearing on problems connected with the mechanism of chemical reactions will be described. Radioactive and nonradioactive indicators ("Labelled Atoms") will be dealt with by Professors S. Sugden and W. F. K. Wynne-Jones respectively. Dr. M. Ritchie will discuss reactions of free atoms; Professor T. Alty, accommodation coefficients; and Dr. H. W. Melville will describe recent technique in photochemistry.

At the last Dundee meeting of the British Association in 1912 Professor A. McKenzie opened a discussion on the migration of groups and dealt especially with the Walden rearrangement. During the quarter of a century which has elapsed the Dundee school under his leadership has greatly advanced our knowledge in this field. On the present occasion Professor McKenzie and Dr. R. Roger will open a discussion on Intramolecular Change involving the migration of groups and will give an account of their work on de-amination and dehydration involving semi-pinacolinic rearrangements in which optically active alcohols and glycols have been used. Contributions will also be made by Professor M. Tiffeneau (Paris), Dr. S. F. Birch, who will deal with the catalytic isomerisation of paraffins, Dr. A. K. Mills and Dr. T. S. Stevens.

A special feature of the meeting will be a two-day discussion on Jute, the principal industry of Dundee, including chemical and physical as well as economic aspects of the subject. In this connection a comprehensive exhibition will be open throughout the meeting. For the Dundee school children two popular lectures will be given. Dr. D. A. Spencer will deal with colour photography and Dr. H. W.

(*Continued at foot of next column*)

(*Continued from previous column*)

Melville will give an experimental lecture on the methods of producing light.

By kind invitation of the University Court a visit will be made to the University of St. Andrews, and visits to jute spinning mills and Messrs. Moncrieff's glass works at Perth are being arranged. The usual sectional dinner will be held. The following chemists have accepted the Council's invitation to attend as foreign guests of the Association: Dr. H. Theorell (Stockholm), Professor Marc Tiffeneau (Paris), and Professor A. von Zeerleder (Zürich).

Crop Production

The Application of Trace Elements

THE final session of the symposium "The Trend of Progress— Where are we Heading?" held during last week's annual meeting of the Society of Chemical Industry at Exeter, took place last Friday, when Sir E. J. Russell, D.Sc., F.R.S., the Director of the Rothamsted Experimental Station, addressed the members on progress in crop production. The chairman was Mr. E. B. Anderson, the newly-elected Chairman of the Food Group of the Society. Extracts from Sir John's address were published in last week's issue (pages 50-51) and the following are views expressed in the discussion regarding the application of trace elements in agriculture.

DR. H. A. THOMAS asked whether trace elements must be applied in the water-soluble form in order to be effective, and whether large experiments had been made with different forms of soluble salts. For instance, were there any differences in the effects of zinc sulphate and zinc chloride on the growth of plants or the nutritive value of the plant to the animals grazing on it?

Trace Elements and Disease Resistance

DR. H. SHAW said that with regard to trace elements in horticulture, it was found that they affected not only the quality and the growth of the produce, which was very evident, but also the resistance to disease. The onset of pests and disease was very closely bound up with the nutritional status of the trees.

Following the remarks of Dr. Thomas, he mentioned an experiment in which an insoluble zinc compound—more or less a counterpart of Bordeaux mixture, in which zinc was used—was used as a fungicide. The main experiment had failed and the fungus had grown; but the foliage produced in that experiment was more wonderful than he had ever seen on the trees, and there was no doubt that the zinc got on to the trees by being sprayed on the foliage in the insoluble form.

SIR JOHN RUSSELL, in the course of his reply to the discussion, said that he supposed that in the interesting experiment at East Malling, referred to by Dr. Shaw, the insoluble material was the zinc carbonate and was as effective as anything else in getting through the foliage. But things did not always work in that way. One experienced manganese deficiencies on soils which contained a fair amount of manganese, the difficulty being that the manganese was present in a form in which the plant could not get at it. We did not know a lot about it, but he believed there might be certain combinations of boron which the plant coud not get hold of.

IN THE RECENTLY PUBLISHED annual report of L'Air Liquid S.A. pour L'Etude et L'Exploitation des Procedes Georges Claude it is stated that the company is constructing near Constantine, Algeria, an oxygen and acetylene plant, principally to meet the needs of the new railroad workshops in the region. A branch has been formed in Buenos Aires, Argentina, where the company expects to acquire the four local oxygen plants and the acetylene plant, an option having been taken on them. During 1938 a new dissolved acetylene plant was opened at Shaques (Pas-de-Calais). It is reported also that the products in France increased during 1938 with the exception of the fourth quarter, when international developments adversely influenced sales.

Electric Carbonisation of Coal*

By
H. STEVENS

THE electric carbonising process uses electricity to make coke, gas and oil from any bituminous coal or lignite. It differs from other processes not only in that coal is heated electrically, but that a mass of coal is heated from within. This is possible because bituminous coal, which is a poor conductor of electricity, becomes a relatively good electrical conductor upon heating and during its transformation into coke. As the heating is done from within a mass of coal contained in a retort, the raw coal, which is an insulator of both heat and electricity, acts as the effective retort lining.

The retort used for this process is cylindrical and constructed of firebrick encased in a welded steel shell. It is suspended vertically in a steel cradle, supported by columns rising from a concrete base. The top and bottom steel covers are lined with firebrick and through their centres pass short graphite electrodes. The top cover is electrically insulated, the bottom cover and the steel work are grounded.

Mode of Operation

When operating, the bottom cover is placed in position, and a vertical starting fuse, a conductor pipe filled with coke, contacting the top and bottom electrodes, is centred in the retort, which is then completely filled with coal. The charge may amount to as much as thirty net tons, depending on the variety, the size of the pieces and the relation between these sizes and the moisture content of the coal charged. The top cover is then placed in position and the current turned on. Electricity flows through the starting fuse, heating it and the surrounding coal, driving moisture, gas and oil outward. The layer of coal surrounding the fuse becomes coke and makes a definite path for the current, because being formed *in situ* it is compact and therefore is a better conductor of electricity than the vertical column of loose coke particles constituting the starting fuse. As carbonisation proceeds, more gas and oily vapours are driven from the coking material and fissuring occurs. The newly formed coke begins to shrink and at about 1,000° C. reaches its maximum density. The electrical conductivity of this cracked and fissured coke core is now at a minimum. Meantime the seepage of plastic material has consolidated another tubular ring of coal, which in turn forms a compact layer of coke, offering easier passage for the electric current than the inner core of shrunken coke. In this manner the zone of heat generation travels radially outward, the heat always being electrically generated adjacent to the raw coal until the entire charge is carbonised.

Gas and oily vapours driven from the heated coal pass over cold coal and are thereby scrubbed and cooled before they leave the retort through suitable outlets into collecting mains. Practically all the oil evolved during carbonisation is drained from the bottom cover. When carbonisation is completed, the top cover is lifted and any residual gas is ignited. Upon removal of the bottom cover the hot coke falls by gravity into the conveyor, where it is quenched.

Thus it will be seen that the electrical carbonising process, in taking advantage of all these properties of coal and coke, makes for a highly advantageous utilisation of heat. Its thermal efficiency (ratio of heat output and heat input) is better than 0.95.

Turning now from the process to the equipment involved, it is necessary to compare the electric process with the present method of carbonisation which has been in use in the United States since 1893, i.e., the by-product method, which means, according to The American Society for Testing Materials, "The method of manufacturing coke with attendant recovery of by-products in ovens that are heated externally."

In the by-product method using a long narrow prismatic oven, the heat for carbonisation, generated by the combustion of gas in air in external flues, reaches the coal by passing through oven walls. A series of ovens and flues with the regenerative heating system beneath constitutes a battery. Such a battery requires over 500 different shapes of brick in its construction. Some of these, being subjected to the white heat necessary for operation, must be silica brick. Before being placed in commission these by-product ovens must be slowly dried out and gradually raised to the operating temperature (1,300-1,400° C.), a procedure requiring months. The fires once lit must never be allowed to go out, for silica brick, if allowed to cool, will disintegrate and the usefulness of the oven be destroyed.

In contrast with the by-product method oven, the electric process retort requires only a dozen different shapes of brick for its construction. These are all ordinary firebrick. The retort is made gas tight by enclosing it in a welded steel shell. Other ways for making these retorts gas tight can be devised. The exposed face of the firebrick only momentarily reaches the maximum temperature of approximately 1,000° C., far below the 1,400° C. of the by-product oven. In further contrast to the older oven, the electric retort requires no drying. It can be put into operation immediately on construction. Carbonisation can be started and stopped as often as occasion demands without damage to the apparatus or detriment to products. The wear and tear on the firebrick as well as on the graphite electrodes is practically nil. As the other equipment is scarcely ever subjected to a temperature much above atmospheric, the maintenance costs for both material and labour are low.

The differences in the generation and application of heat in the older by-product method and in the new electric process lead to a difference in the capacity of the ovens and retorts. By-product ovens operate most efficiently with their present capacity of about 15 tons of coal. The electric process operates with retorts having a capacity of 1.5 and 30 tons of coal, respectively. Intermediate or larger capacity retorts can be built. The electric process uses only three-fourths of the ground area required by the by-product method.

Of the products of carbonisation, coke is generally recognised as having the greatest monetary value. In the electric process the largest lump coal, as well as the finest pulverised, or any intermediate size or mixture of these sizes of coal can be carbonised successfully. In the by-product oven the coke adjacent to the walls reaches a temperature at least 200° C. higher than the coke at the centre of the oven. For this reason it does not have uniform burning characteristics. Because of the inherent features of the electric process and the specific electrical conductivity of coke, electrical coke is, in contrast, all uniformly heated, and has, therefore, uniform burning characteristics.

Production of Oil

Tar from the by-product method averages 9 gal./ton (375 cc./kg.) of coal. The low-temperature oil produced by electric carbonising varies in amount from 12 to 27 gal./ton (400 to 1,125 cc./kg.) of coal, depending on the character of the coal and the rate of carbonisation. The electric oil has low specific gravity, viscosity and low pitch content; it is high in tarry acids as compared with by-product method tar. The commercial possibilities of electric oil have never been explored. There exists the possibility of cataphoresis or electrolysis of these tarry acids for use in the manufacture of plastics. It is possible the electric process may be extended to produce hydrogen or methane or even acetylene. Here is a vast field of development for the disciplined imagination of the electrochemist.

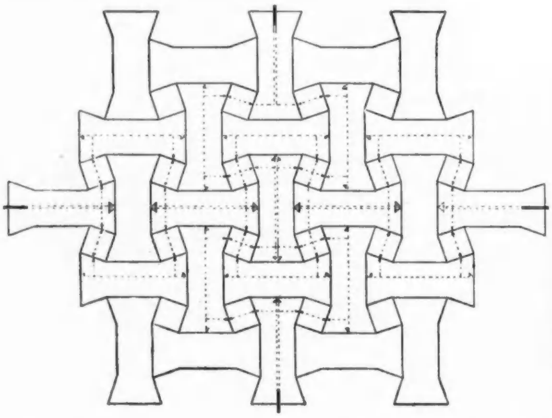
In general, the electric carbonising process produces a readily saleable coke that is easy to ignite and has uniform burning characteristics. From one ton of coal it produces ten thousand cubic feet of gas with a calorific value of 530 B.t.u./cu. (4,700 k.g. cal./cu. m.). This gas is lower in inerts, can be distributed at a lower cost and be used more efficiently than by-product gas. The process yields liquid products amounting to two or three times as much as those obtained from the by-product method.

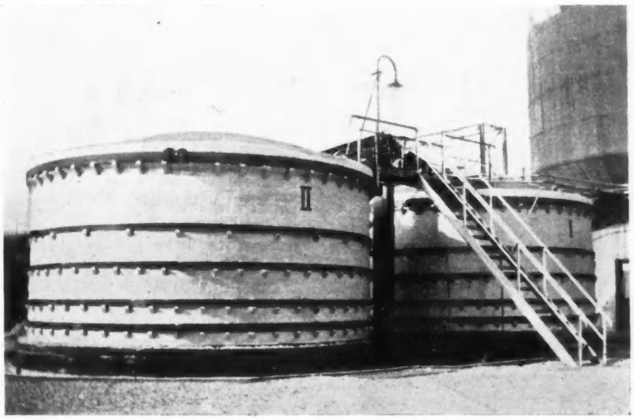
*From a paper presented at the 75th General Meeting of the Electrochemical Society at Columbus, Ohio.

ACID-RESISTING TANKS

A Novel Type of Tile Construction Avoiding Tensile Strains

AN interesting development in the construction of tanks and flues in which acid and alkali resisting qualities are required, has been made by the Produits Anti-Acides Beugin of France. A refractory ceramic sandstone tile of special design is used for the purpose and in the construction of a tank or wall, two shapes of tiles are employed, so designed that any stress on the wall formed, no matter in what direction, is transformed into a compression stress, thus avoiding any strains on the cement used in the construction.





Left: Sketch showing the two shapes of tile and their method of assembly. Right: Two completed Beugin tile tanks, each of 18,700 gallons capacity, for the storage of nitric acid.

One of the shapes used is a small square and the other resembles a dumbbell as seen in the accompanying sketch, which also shows the way in which they are assembled to form a wall. A compression strain on the walls will of course be taken up by the wall construction as such. The case of a tension, however, is more complex. If a tension is introduced at one end of an element, the section at the end of the " dumbbell " will cause a pressure on the small squares filling the interstices between the long tiles. This compression will be transmitted to the surrounding long tiles as a compression strain, so that the only tension possible is within the body of the long tiles.

The cements used in the assembly of the tiles vary according to the nature of the corrosive to which resistance is required. They fall into two groups, one being specially designed for resistance to weak and strong acids and alkalies. In general the solid components of the cement are mixed with sodium silicate to form a mortar which is used in very thin layers between the tiles forming the wall. The second group is formed on a base of either bitumen or synthetic resins, suitable for many cases of acid resistance, and in the case of resin cements, for heat resistance. The tiles themselves are designed to provide maximum density and minimum porosity. The coefficient of dilation is less than 4/1,000ths at 1,000° C. and they are capable of standing up under temperatures, varying with the type, from 1,700 to 1,800° C. Resistance to tractile strains is 45 kilogrammes per sq. cm., while resistance to compression strains is 2 tons per sq. cm.

Symposium on Cellulose

Meeting to be Held by the Society of Dyers and Colourists

ON September 21 and 22 of this year, the Society of Dyers and Colourists will be holding a symposium under the title " Cellulose—Its Chemistry and Properties." The meeting will take place in the College of Technology, Manchester.

The following are the contributions to the symposium :—

Mr. L. G. S. Hebbs, A.I.C. (Messrs. Cross & Bevan)—"Sources of Cellulose."

Mr. E. Butterworth, M.Sc.Tech.,F.Inst.P.,F.T.I. (Messrs. Frazer & Haughton)—" Bleaching of Cellulose."

Dr. T. M. Morton, M.Sc. and Mr. J. Boulton, M.Sc.Tech. A.I.C. (Courtaulds, Ltd.)—" Dyeing of Cellulosic Material—A Review of the Physics and Chemistry of the Dyeing Process."

Dr. J. Craik, M.A., B.Sc. (I.C.I., Ltd.)—" Cellulose Esters and Ethers."

Mr. L. G. Lawrie, A.I.C., D. R. J. Reynolds, Dr. D. Ward, (I.C.I., Ltd.)—" The Action of Ethylene Oxide on Cellulose."

Dr. C. F. Davidson (British Cotton Industry Research Association)—" The Modification of Cellulose by Oxidation."

Dr. H. Hunter, F.I.C., A.Inst.P. (British Cotton Industry Research Association)—" An Accelerated Light Fastness Test in Use at the Shirley Institute."

The above papers will not be given in full at the meeting but briefly introduced by the authors so as to leave ample time for discussion. All these papers will, therefore, be published beforehand and will be available in due course (date and price will be announced later) from the offices of the Society, 32-34 Piccadilly, Bradford.

Finally, two papers will be given *in extenso*, namely :—

" The Constitution of Cellulose " by Professor E. L. Hirst, F.R.S. (Bristol University).

" The Crystallography of Cellulose " by Dr. E. G. Cox (Birmingham University).

This meeting will be under the chairmanship of the President of the Society of Dyers and Colourists, Dr. C. J. T. Cronshaw. Sir Robert Pickard, F.R.S., D.Sc., has kindly agreed to assist by presiding at one of the sessions of the meeting.

British Overseas Chemical Trade in June

ACCORDING to the Board of Trade returns for the month ended June 30, 1939, imports of chemicals, drugs, dyes and colours were valued at £1,489,803, an increase of £586,192 compared with June 19, 1938. Exports were valued at £2,240,180, an increase of £524,186. Re-exports were valued at £40,926.

Imports

	Quantities. June 30, 1938.	Quantities. June 30, 1939.	Value. June 30, 1938. £	Value. June 30, 1939. £
Acids—				
Acetic .. .. cwt.	8,322	18,258	9,987	22,737
Boric (boracic) .. ,,	2,317	5,890	2,752	6,334
Citric .. .. ,,	1,645	1,900	6,683	7,770
Tartaric .. ,,	2,745	2,375	12,712	11,063
All other sorts .. value	—	—	5,129	9,595
Borax .. .. cwt.	2,656	15,710	1,800	9,927
Calcium carbide .. ,,	132,145	152,620	60,627	67,872
Fertilisers, manufactured tons	1,974	1,767	9,281	6,660
Potassium compounds—				
Caustic and lyes cwt.	13,254	17,692	14,433	22,639
Chloride (muriate) ,,	77,782	237,747	28,835	67,106
Kainite and other potassium fertiliser salts cwt.	5,640	209,322	568	44,865
Nitrate (saltpetre) ,,	2,086	16,958	2,009	14,119
Sulphate .. ,,	13,000	166,110	6,099	75,001
All other compounds ,,	7,663	12,090	9,835	14,136
Sodium compounds—				
Chlorate .. .. ,,	1,866	3,405	2,253	3,880
Chromate and bichromate .. .. cwt.	2,215	1,582	2,465	2,134
Cyanide .. .. ,,	2,118	79	4,941	221
Nitrate .. .. ,,	27,453	39,880	6,888	9,098
All other compounds ,,	14,501	21,892	10,274	21,631
Chemical manufactures value	—	—	300,913	426,223
Drugs, medicines and medicinal preparations—				
Manufactured or prepared—				
Quinine and quinine salts .. .. oz.	199,340	107,571	16,052	10,379
Medicinal oils .. cwt.	2,084	5,133	4,824	17,017
Proprietary medicines value	—	—	63,893	70,387
All other sorts .. ,,	—	—	41,211	48,489
Finished dye-stuffs obtained from coal tar cwt.	3,243	4,908	102,134	169,276
Extracts for dyeing ,,	2,318	6,834	5,515	19,161
Extracts for tanning—				
Chestnut .. ,,	32,057	32,157	25,099	21,964
Quebracho .. ,,	14,708	38,433	13,505	35,582
All other sorts .. ,,	20,896	56,838	17,494	44,070
All other dyes and dyestuffs .. .. cwt.	284	1,783	4,714	37,978
Painters' and printers' colours and materials—				
White lead (basic carbonate) .. .. cwt.	8,004	4,875	11,319	6,436
Ochres and earth colours cwt.	24,636	35,234	8,474	12,553
Bronze powders and other metallic pigments .. cwt.	985	2,034	7,246	16,436
Carbon blacks .. ,,	23,914	48,636	31,350	65,735
Other pigments and extenders, dry .. cwt.	62,417	37,747	12,311	8,741
Lithopone .. ,,	27,322	23,516	16,502	13,602
All other descriptions ,,	11,563	17,137	23,484	39,986
Total .. .. value	—	—	903,611	1,489,803

Exports

	Quantities. June 30, 1938.	Quantities. June 30, 1939.	Value. June 30, 1938. £	Value. June 30, 1939. £
Acids—				
Citric .. .. cwt.	1,644	2,639	7,600	11,890
All other sorts .. value	—	—	25,654	26,553
Aluminium compounds tons	2,515	5,178	25,922	41,897
Ammonium compounds—				
Sulphate .. tons	19,223	35,577	125,165	230,492
All other sorts .. ,,	1,151	6,184	17,536	72,069
Bleaching materials—				
Bleaching powder (chloride of lime) .. cwt.	44,290	50,383	13,894	15,519
All other sorts .. ,,	3,810	6,707	11,160	17,046
Coal tar products—				
Cresylic acid .. galls.	147,987	196,076	22,787	19,061
Tar oil, creosote oil ,,	2,858,207	3,663,490	71,028	59,580
All other sorts .. value	—	—	13,982	10,017
Copper, sulphate of, tons	6,338	4,270	93,964	66,555
Disinfectants, insecticides, etc. .. .. cwt.	20,368	34,374	47,743	82,920
Fertilisers, manufactured tons	4,757	10,465	35,636	58,361
Glycerine .. .. cwt.	11,560	5,675	47,806	15,076
Lead compounds .. ,,	12,511	16,977	17,431	25,500
Magnesium compounds tons	384	581	9,395	12,576
Potassium compounds cwt.	3,905	4,995	7,578	12,066
Salt (sodium chloride) tons	16,829	25,765	44,694	66,710
Sodium compounds—				
Carbonate, including soda crystals, soda ash and bicarbonate cwt.	285,658	370,809	65,721	93,919
Caustic .. .. ,,	175,872	249,716	93,688	125,361
Silicate (water glass) ,,	21,571	25,656	6,031	7,715
Sulphate, including salt cake .. .. cwt.	67,679	74,354	8,516	8,853
All other sorts .. ,,	51,304	77,456	76,494	102,612
Zinc oxide .. tons	1,079	1,406	19,873	23,995
All other descriptions value	—	—	184,141	235,670
Drugs, medicines and medicinal preparations—				
Quinine and quinine salts .. .. oz.	64,987	264,001	8,000	28,715
Proprietary medicines value	—	—	93,048	115,882
All other descriptions ,,	—	—	127,204	160,738
Dyes and dye-stuffs and extracts for dyeing and tanning—				
Finished dye-stuffs obtained from coal tar—				
Alizarine, alizarine red and indigo (synthetic) cwt.	317	752	3,538	6,627
Other sorts .. ,,	4,679	7,304	74,751	110,280
Extracts for tanning ,,	10,580	26,042	9,466	23,829
All other descriptions ,,	1,558	1,748	7,102	8,630
Painters' and printers' colours and materials—				
Ochres and earth colours cwt.	9,125	12,132	11,174	14,000
Other descriptions specified in Export List cwt.	7,515	10,010	26,708	34,319
White lead .. ,,	4,341	4,953	8,803	9,643
Ships' bottom compositions cwt.	3,448	2,515	10,779	8,062
Lithopone .. .. ,,	13,356	12,434	9,951	9,341
Paints and painters' enamels .. .. cwt.	37,057	40,586	109,784	119,937
Varnish and lacquer (clear) .. galls.	66,985	74,686	26,622	32,276
Printers' ink .. cwt.	4,239	5,135	20,565	25,309
All other descriptions ,,	37,365	47,987	75,060	90,579
Total .. .. value	—	—	1,715,994	2,240,180

Re-Exports

	Quantities. June 30, 1938.	Quantities. June 30, 1939.	Value. June 30, 1938. £	Value. June 30, 1939. £
Chemical manufactures and products .. value	—	—	23,423	23,168
Drugs, medicines and medicinal preparations value	—	—	14,225	15,270
Dyes and dye-stuffs and extracts for dyeing and tanning .. .. cwt.	163	160	2,039	1,310
Painters' and printers' colours and materials cwt.	1,062	513	1,808	1,178
Total .. .. value	—	—	41,495	40,926

Recent Trade Literature

Two booklets have been recently issued by the VALOR CO., LTD. The first deals with fire prevention appliances and includes details of the "Valor-Fydrant" chemical fire extinguisher which complies with the specification of the Fire Offices Committee, London, and is tested to a pressure of 350 lb. per square inch, and the "Valor-Foamera" extinguisher which is a new type of foam extinguisher for overcoming burning petrol, oil, grease, or other imflammable material. The second deals with Valor steel office and works equipment.

The new issue of the Sulzer Technical Review issued by SULZER BROS. (LONDON), LTD. contains a review of the development in Sulzer refrigerating machinery during the last 60 years, construction having been started in 1878. An article deals with the high-temperature water heating installations built by the firm in recent years particularly for industrial purposes. During the past year Sulzer centrifugal pumps built or under construction reached a total of 230,000 h.p. Interesting among the year's refrigerating machines are the ammonia compressor of 40 million B.Th.U/h, the largest in the world, supplied to a chemical undertaking in Central Europe, and the successful putting into service of a completely automatic plant for maintaining low temperatures.

THE FISCHER AND PORTER CO., Philadelphia, the London agent of which is F. A. Williams, Gracechurch Street, E.C.2, have issued a brochure dealing with Rotameters. A description is given of a Rotameter sight flow meter which measures the rate of flow of any liquid, vapour or gas. It derives its name from the fact that a rotating free float is the metering element and it is claimed that it can be used for measuring the smallest laboratory flows or for measuring flows running into hundreds of gallons or thousands of cubic feet per minute. All the tapered glass tubes used in the Rotameters are made by the exclusive F. and P. precision-bore process and each tube of a given size is interchangeable with any other tube of the same size.

A brochure describing the "Galahad" range of stainless steel and stainless iron has been issued by HADFIELDS, LTD. These steels are high grade products which contain about 13 per cent. of chromium as the main alloying element. This type of steel is not so generally resistant to the many different forms of corrosion as the more expensive austenitic stainless steels, but there are, nevertheless, a great many applications where the corrosive influence encountered is of a relatively mild nature, and where steel of the plain high chromium type is perfectly satisfactory. In addition the company has issued an abridged list giving the salient characteristics of a range of special steels resistant to heat and corrosion, and a booklet illustrating the "Hecla" improved pulling jack.

THE KESTNER EVAPORATOR AND ENGINEERING CO., LTD., have issued leaflet No. 262 (superseding No. 229) dealing with Kestner Keebush fans. These fans can be used for gases such as hydrogen chloride which will quickly corrode and destroy ordinary cast iron, steel, or lead-lined impellers and the initial cost will, it is claimed, quickly be saved by the long life of the fan and the minimum attention that is necessary. The fan casings are made entirely in Keebush acid-resisting material and the impellers are constructed in solid Keebush. The shaft rotates in massive bearings of ball or roller in a cast-iron housing or special plain bearings, and the whole assembly is bolted to a substantial cast-iron frame. Fans can be arranged for direct motor drive, vee belt or flat belt drive according to requirements.

Soap, Perfumery and Cosmetics has issued its Buyer's Guide and Cyclopædia for 1939. The foreword has been written by Dr. S. C. Johnson, chairman of the Perfumery and Toilet Preparations Manufacturers' section of the London Chamber of Commerce, and general manager of

(*Continued at foot of next column*)

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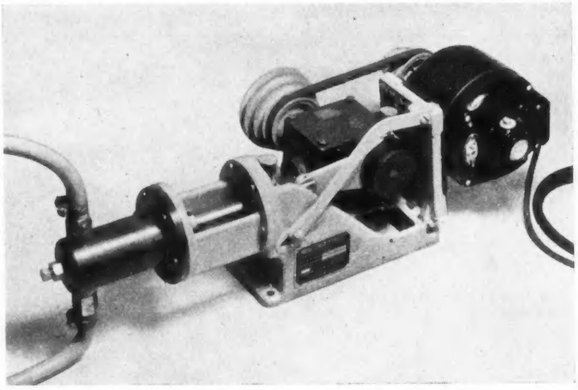
Morny, Ltd., and the year's progress in the various industries covered by the monthly journal is reviewed by Dr. Arthur Lewinson, Mr. Hugo Janistyn, Mr. Ralph H. Auch, D. J. Davidsohn and Mr. F. V. Wells, editor of *Soap, Perfumery and Cosmetics*. The important section of tabular matter has this year been substantially enlarged and also conveniently sub-sectionalised and new features include notes on the Poisons List, a list of selling agents in various parts of the world, and various additions to the section entitled "Foreign Standard Specifications" (for soaps, polishes, disinfectants, tooth pastes, etc.). The book is priced 10s. 6d.

Chemical Treatment of Water

A Regulatory Device

AN apparatus which is particularly suitable for the chemical treatment of water, for sterilisation by hypochlorite, *p*H control, and similar purposes, has been devised by the Proportioneers Inc., Providence, R.I., U.S.A. The apparatus is built in such a way as to permit operation either on a constant feed or on a variable feed of liquid, into which a definite proportion of the treating chemical is to be injected. It comprises a small single cylinder pump, provided with a connection to a tank of hypochlorite, or other chemical solution and a second connection to the pipe in which the water or other liquid to be treated is flowing. Where the flow is constant, it is possible to drive the pump by means of a small electric motor which is connected to the



same power line as the main pump motor regulating the flow of water. In this way whenever the flow of water stops, the flow of chemical solution also stops.

Construction

The motor is mounted on one end of the frame which carries the pump, and is connected by a belt drive to a conical pulley wheel. This in turn operates a gear mounted on the pump frame, which has a cam of regulatable eccentricity. In this way a regulation of the percentage of chemical solution injected into the water to be treated is obtained. Feed to the pump is by means of a pipe or hose inserted into a vat of the solution to be pumped, while feed into the flow of water is by means of a pipe or hose entering the main flow pipe through a check valve.

Where the flow of water to be treated is variable, the pump is operated by a small water motor, fed from part of the water to be treated. The total flow of water is measured by a water meter built into the same block as the pump. As the speed of operation of the pump is regulated by the flow, the proportion of chemical solution to be added can be easily maintained at all flows. The makers point out that this type of installation is particularly interesting for the treatment of limited quantities of water, say up to about 1,500,000 gallons per day.

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Mineral Oils, Gas, Tar

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PERSONAL NOTES

MESSRS. T. F. A. BOARD AND H. H. WOOLVERIDGE have been appointed directors of British Industrial Solvents, Ltd.

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MR. FRANCIS D'ARCY COOPER, chairman of Lever Brothers and Unilever, Ltd., who has been ill for some months, resumed his duties at Unilever House, on Monday.

* * * *

SR. ROBERTO WALCHHOLTZ, Finance Minister, Santiago, Chile, has been elected president of the Chilean Nitrate Sales Corporation, succeeding Sr. Gustavo Ross, who has resigned.

* * * *

MR. A. E. BRISCOE has retired from the position of works manager of the basic products department of the Steetly Lime and Basic Co., Ltd., Worksop, after having completed 52 years' service with the firm.

* * * *

DR. ROBERT S. SILVER has received an appointment with G. and J. Weir, Ltd., engineers, Glasgow, where he will conduct research into engineering problems. Since 1936 he has been research physicist on the staff of I.C.I., Ltd., at Ardeer.

* * * *

MR. D. R. C. PHILIP, who became a director of John Dewar and Sons, Ltd., distillers, Perth, early this year, has now been appointed joint managing director of the company. For 18 years Mr. Philip was general manager of the firm in South Africa.

* * * *

MR. A. J. BRAIN has been appointed Birmingham manager of the Deloro Smelting and Refining Co., Ltd., Shirley, Birmingham, and will control the Stellite sales department. He succeeds MR. W. P. HULME, who has been appointed to the firm's works at Deloro, Ontario, Canada.

* * * *

DR. R. D. HAWORTH has been appointed by the Council of Sheffield University to the Chair of Chemistry in succession to PROFESSOR R. P. LINSTEAD, who has resigned. DR. BRYNMOR JONES has been appointed to the post of Lecturer in Organic Chemistry at the University.

* * * *

MR. GRAHAM CUNNINGHAM (chairman and managing director of the Triplex Safety Glass Co., Ltd.) has been appointed chairman and managing director of Lancegaye Safety Glass (1934), Ltd., and LORD STANMORE, CAPTAIN A. V. W. SHEPERD and MR. G. W. ANSTEY have been appointed directors, following the acquition of the company, and of its subsidiary, Gilt Edge Safety Glass, Ltd., by the Triplex Co. The board of Gilt Edge Safety Glass, Ltd., has also been reconstructed.

* * * *

THE Trustees have awarded Beit Fellowships for Scientific Research, tenable at the Imperial College of Science and Technology during the academic year 1939-40, as follows: *Extensions of Fellowships satisfactorily held for one year to:* DR. E. J. HARRIS for the continuation of research on organic peroxides in relation to hydrocarbon combustion, under the direction of Professor A. C. G. Egerton, F.R.S.; MR. J. L. O. G. MICHIELS for the continuation of research, on the fission of uranium by neutrons, under the direction of Professor G. P. Thompson, F.R.S. *New Fellowships tenable for one year but renewable for a second to:* MR. A. L. G. REES, Melbourne, for research on problems of a physico-chemical nature concerned with compounds of germanium, under the direction of Professor H. V. A. Briscoe, D.Sc.

MR. JOSEPH THWAITES, a director of the Bleachers' Association, and managing director of A. C. Bealey and Co., Ltd., bleachers and finishers, has left estate valued at £8,807 (net personalty £8,570).

MR. RICHARD A. CRIPPS, F.I.C., Ph.C., has left property of the value of £8,963 (net personalty £3,885).

OBITUARY

MR. HENRY BLACK, of Higginbottom and Co. (Manchester), Ltd., chemical merchants, Spring Gardens, Manchester, has died at the age of 63.

* * * *

MR. RICHARD DAVID BRYANT, former manager of Lawes Chemical Co., Ltd., and a late member of the Council of the Fertiliser Manufacturers' Association, died recently at the age of 54.

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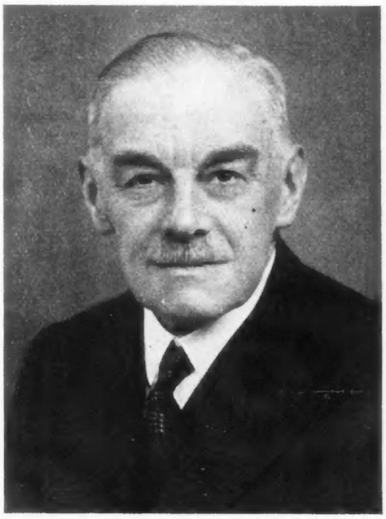
MR. JOHN EDWARD UTTLEY, of Littleborough, near Rochdale, Lancs., in business as a chemical manufacturer at Red



The late Mr. J. E. Uttley.

Lees Works, Littleborough, trading as M. Uttley and Co., died last week at the age of 74. He is survived by his wife and a son, Mr. Donald E. Uttley, who has in recent years shouldered the main burden of management of the works.

New Technical Books

AN INTRODUCTION TO CRYSTAL CHEMISTRY. By R. C. Evans. Pp. 388. London: Cambridge University Press. 18s.

Crystal chemistry in its widest sense may be defined as the study of the relationship of the internal structure of a body to its physical and chemical properties. It seeks to interpret the properties of any substance in terms of its crystal structure, and, conversely, to associate with any structural characteristics a corresponding set of physical and chemical properties.

Crystal chemistry is not, however, a purely descriptive science, and it is in the interpretation of the observed crystal structures and in their correlation with physical and chemical properties that the chief significance and interest lies. The time has now come when a sufficiently wide and diverse range of compounds has been investigated for some of the general principles of crystal architecture to have emerged, and in this book an attempt is made to survey critically the broad field to which X-ray methods have been applied and to codify some of these principles. Though primarily a text-book for university students, the book is also designed as an introduction to the subject for the pure chemist with no specialised crystallograph training.

General News—From Week to Week

A WALSALL FIRM of leather manufacturers, it is understood, are to reopen the old Rivaldsgreen Tannery at Linlithgow, which has been closed for 10 years.

NEGOTIATIONS ARE PROGRESSING in the new move to initiate calcium carbide production in Scotland, writes our Scottish correspondent. After previous disappointments over the defeat of the Caledonian Power Bill, the interests concerned consider that experts have evolved a scheme which will probably prove acceptable even to the fiercest opponents of the previous measures. The negotiations now in progress may result in another new scheme being put up for Parliamentary approval.

IT WAS LEARNED on Tuesday that I.C.I., Ltd., whose works at Mossend, Larnarkshire, closed for production a few weeks ago, are to provide opportunities for a number of the younger men formerly employed at the works to join the permanent staff of I.C.I. as analytical assistants. The men chosen are to be sent to Billingham to be trained in the laboratories there. After completing their period of training, the men will be sent to join the various I.C.I. works throughout the country.

A REVIEW OF PHOTOGRAPHY during the past one hundred years forms the subject of an exhibition which was opened at the Science Museum, South Kensington, on Thursday. The exhibition includes a collection of early apparatus and photographs, illustrating the work of Niepce, Daguerre, Fox Talbot, Herschel, Scott Archer, David Octavius Hill, and their successors down to the present day, and illustrates the scientific uses of the camera. The exhibition will remain open for five weeks.

INCOME RECEIVED FROM TAR by the Manchester Corporation Gas Department during the year to March 31 last averaged 32s. 2d. per ton compared with 44s. 3d. in the previous year. This drop was responsible for a decreased income of £18,250. The deterioration in the tar market is due to two main causes, *i.e.*, the unfavourable international situation and overproduction caused by the increasing number of coke oven plants brought into operation. The quantity of tar made was 28,008 tons, representing 15.02 gallons per ton of coal. The output of ammonium products was 2,278 tons, equivalent to 13.45 lbs. per ton of coal. The production of benzole, etc., products was 554,636 lbs. or 1.46 gallons per ton of coal.

WINCHESTER COUNCIL have approved an expenditure totalling £54,000 on new pumping plant, wells and equipment. A Bill will be promoted to authorise trial borings and subsequently a well which, with equipment, is estimated to cost £42,000. Some anxiety exists in the area owing to occasional water pollution from an unknown cause and in consequence a chlorination plant was installed recently. According to periodical analyses the chlorinated water is safe but that not chlorinated has varied to the danger margin. The Ministry of Health have stated that in view of pollution risks they agree that the area should not rely on one supply source. The Ministry recommend that a filtration plant should be installed immediately.

THE HOME OFFICE is arranging to sell to public utility undertakings and industrial and commercial concerns the steel helmets which they will require for their air raid precautions services in compliance with their prospective obligations under the Civil Defence Bill. These helmets will become available immediately at the rate of about 100,000 a week. Sales of helmets will be confined to those concerns which will have a statutory obligation under the Bill to train and equip members of their staffs to form air raid precautions services within the premises or undertaking. The numbers of helmets required by industrial and commercial concerns will vary with the size and nature of the concern. Guidance on this and similar matters is obtainable from a Preliminary Memorandum on the Organisation of Air Raid Precautions Services in Industrial, etc., Undertakings, which has now been issued. The price of the complete helmets will be 8s. 6d. each carriage paid to any address in Great Britain. Orders for helmets from industrial and commercial concerns should be forwarded on a special form H.1, which is being distributed through trade associations of employers, etc. If no copy is received from these sources, or if a firm is not a member of such an organisation, one may be obtained free of charge from the Finance Office, Home Office, Whitehall, London, S.W.1.

AS FROM TO-DAY (SATURDAY) the telephone number of the Institution of Chemical Engineers is changed to Victoria 6161/2.

FREDK. BRABY AND CO., LTD., announce that their Liverpool works will be closed for the annual holiday during the period August 5 to August 12, 1939, inclusive. A small staff will be available to deal with urgent correspondence, but it will not be possible to receive or despatch any goods during the holiday.

HIGH-GRADE LUBRICANTS are to be manufactured at a new chemical factory to be established at South Shields by the Tyne Chemical Co., Ltd. South Shields Corporation has leased a site to the company and work on construction of the factory is expected to begin almost immediately. When the factory starts production it will be the only works in Europe to manufacture a type of grease with the high melting point of 300° F. and which will be insoluble in water. At the present time Britain can only secure supplies of this grease from America. In addition, various types of industrial chemicals will be manufactured.

THE HOME OFFICE AIR RAID PRECAUTIONS DEPARTMENT has arranged with the British Standards Institution to prepare and issue on their behalf a special A.R.P. series of British Standards for Air Raid Precaution purposes. The preparation of these standards will be under the control of a special advisory committee and in accordance with the usual practice of the B.S.I., will be carried out in the closest co-operation with Government departments and the industry concerned. All communications relating to this work should be addressed to the British Standards Institution, 28 Victoria Street, Westminster, S.W.1.

NEW WORKS AND EXTENSIONS.—JOHNSON AND SONS, MANUFACTURING CHEMISTS, LTD., have had plans approved for extensions to their Hendon Way factory. Extensions to the Mill Lane Works, Liverpool, of GOODLASS WALL AND CO., enamel manufacturers, have been proposed. SHELL MEX AND B.P., LTD., plan to build large research laboratories at Cox Lane, Surbiton. THE RAINHAM STARCH WORKS have had plans approved by Hornchurch U.D.C. for the erection of a factory at Ferry Lane. The Barnet (Herts.) Rural Council have, subject to certain conditions, given consent to YARDLEY AND CO., LTD., to carry on the business of soap-boilers in a factory which the company propose erecting on a site at Borehamwood, Herts.

THE INCIDENCE OF INJURIES to farm workers through the greater use of chemical compounds and artificial manures on the farms, was discussed by the Royal Commission on Workmen's Compensation recently, when the National Federation of Rural Approved Societies gave evidence before the Commission. Mr. H. H. Leeman, appearing for the Federation, said that there was an increasing incidence of injuries caused through the use of artificial manures on the farms, but he was unable to supply any statistics, as he had not been asked for them by the Home Office or the Ministry of Agriculture. Such statistics could be supplied, if application was made for them. The Federation supported the principle of compulsory insurance for workmen's compensation, but did not oppose the carrying of the liability by the insurance companies, provided that the obligation was made obligatory upon all employees. The Commission adjourned to take further evidence.

Foreign News

EXPORT DUTIES have been established in Poland on various coal tar derivatives, including benzol, toluol, xylol, solvent naphtha, naphthalene, phenol and cresol and anthracene.

THE UNITED STATES has shipped 200,000 cubic feet of helium to Poland for a stratosphere flight, but refuses delivery of supplies to Germany, states the *Daily Telegraph* New York correspondent.

THE STATE CELLULOSE FACTORY at Niedomice (Poland) is planning to produce alcohol from celluose waste lyes in new premises to be erected at a cost of 500,000 zloty. With an estimated yield of 7 to 8 per cent. pure alcohol (according to laboratory tests) the cost of manufacture is calculated at 28 to 32 groschen per litre.

Inventions in the Chemical Industry

The following information is prepared from the Official Patents Journal. Printed copies of Specifications accepted may be obtained from the Patent Office, 25 Southampton Buildings, London, W.C.2, at 1s. each. The numbers given under "Applications for Patents" are for reference in all correspondence up to the acceptance of the Complete Specification.

Applications for Patents

NICKEL-BERYLLIUM ALLOYS.—Seri Holding Soc. Anon. (Oct. 4, '37.) (Italy, June 30, '38.) 18564.

ARTIFICIAL CERAMIC PRODUCT, ETC.—F. Singer. 18324.

TREATMENT OF JUTE.—F. E. Smith. 18571.

MANUFACTURE OF ALDEHYDES of the saturated, etc., pregnane-series.—Soc. of Chemical Industry in Basle. (Switzerland, July 1, '38.) 18805; (Switzerland, Nov. 14, '38.) 18806; (Switzerland, May 12.) 18807; (Switzerland, June 13.) 18808.

MANUFACTURE OF ALDEHYDE KETONES.—Soc. of Chemical Industry in Basle. (Switzerland, July 1, '38.) 18809; (Switzerland, June 1.) 18810.

MANUFACTURE OF ESTERS of the oxy-stilbene series.—Soc. of Chemical Industry in Basle. (Switzerland, July 2, '38.) 18811; (Switzerland, May 11.) 18812.

PROCESS FOR IMPROVING THE FASTNESS OF DYEINGS.—Soc. of Chemical Industry in Basle. (Switzerland, July 4, '38.) 18813; (Switzerland, Nov. 30, '38.) 18814; (Switzerland, June 5.) 18815.

PRODUCTION OF A RESIN-LIKE CASEIN GLUE.—T. Sparre. 18218.

HIGH OCTANE NUMBER MOTOR FUELS.—Standard Oil Development Co. (United States, Nov. 25, '38.) 18819.

MANUFACTURE OF ARTIFICIAL FIBRES from protein material.—D. Traill, W. Sever, and Imperial Chemical Industries, Ltd. 18569.

STARCH HYDROLYSIS.—Union Starch and Refining Co. (United States, July 5, '38.) 18704.

PRODUCTION OF ETHYLENE OXIDE.—U.S. Industrial Alcohol Co. (United States, Aug. 6, '38.) 18348.

THERMO-SETTING PLASTICS.—C. H. Verity. 18155.

MANUFACTURE OF A DETERGENT, ETC., AGENT.—E. Watanabe, and S. Kawamura. 18287.

RAPID, ETC., PURIFICATION OF METALS.—W. P. Williams (Soc. d'Electrochemie, d'Electrometallurgie, et des Ancieres Electriques d'Ugine). 18256.

RUBBER LATEX SOLUTIONS, ETC.—F. W. Wren, and J. E. M. Mason. 18310.

PRODUCTION OF ACROLEIN.—Acrolein Corporation. (United States, July 27, '38.) 19897.

DEWAXING OF MINERAL OILS.—Aktiebolaget Separator-Nobel. (Sweden, July 14, '38.) 20310.

PRODUCTION OF MOTOR FUELS.—Anglo-Iranian Oil Co., Ltd., and E. McNeill. 20363.

APPARATUS FOR THE DISPOSAL OF SOLID residues from furnaces.—Babcock & Wilcox, Ltd., and P. B. Silk. 19922.

PURIFICATION OF GASES.—B. Berghaus. (Germany, July, 15, '38.) 19858.

PRODUCTION OF PRODUCER GAS FROM CHARCOAL.—Brayshaw Furnaces & Tools, Ltd., S. N. Brayshaw, F. C. Newman and F. Rushton. 19913.

MANUFACTURE OF CELLULOSE DERIVATIVES.—British Celanese, Ltd. (Celanese Corporation of America). 19953.

MINERAL OILS.—British Thomson-Houston Co., Ltd. (United States, July 7, '38.) 19721.

MANUFACTURE OF AZODYESTUFFS.—A. Carpmael (I. G. Farbenindustrie). 20186.

GLUCOSIDIC COMPOUNDS.—A. Chwala. (Germany, July 15, '38.) 19979.

SULPHONATION.—Colgate-Palmolive-Peet Co. (United States, July 7, '38.) 19668.

MANUFACTURE, ETC., OF SUBSTITUTION products of urea.—Deutsche Hydrierwerke Akt.-Ges. (Germany, July 7, '38.) 19847.

MANUFACTURE OF HYDROGENATION CATALYSTS.—Distillers Co., Ltd., and J. Francon. 20213, 20214.

MANUFACTURE OF ORGANIC COMPOUNDS.—H. Dreyfus. 19707, 19708.

OXIDATION OF CYCLIC HYDROCARBONS.—E. I. du Pont de Nemours & Co. (United States, July 12, '38.) (United States, June 6.) 20335, 20336.

APPLICATION OF COATING COMPOSITIONS.—E. I. du Pont de Nemours & Co., and E. C. Pitman. 19750.

MANUFACTURE OF DIAZONIUM COMPOUNDS.—E. I. du Pont de Nemours & Co., and F. Zwilgmeyer. 19749.

CRYSTALLIZED GLUCOSIDE, ETC.—L. S. E. Ellis (Sandoz, Ltd.). 20345.

METHOD OF MAKING STEEL.—Emulsions Process Corporation. (United States, Oct. 28, '38.) (United States, Dec. 1, '38.) (United States, Feb. 28.) 19681, 19682, 19683.

PRODUCTION OF LACTRO-ALBUMIN, etc., from milk residues.—C. H. Field. 20074.

PRODUCTION OF LARGE CRYSTALS of ergosterol, etc.—General Mills, Inc. (United States, July 9, '38.) 19957.

DEWAXING OF HYDROCARBON OILS.—W. W. Groves (Edeleanu Ges.). 20306.

MANUFACTURE OF SUBSTANCES of capillary action.—W. W. Groves (I. G. Farbenindustrie). (Jan. 25, '38.) 20304

MANUFACTURE OF BASIC ESTERS.—W. W. Groves. 20307.

MANUFACTURE OF ANTIMONY TRIOXIDE PIGMENTS.—I. G. Farbenindustrie. (Germany, July 7, '38.) (Germany, March 17.) 19735, 19736.

MANUFACTURE OF ARTIFICIAL fibres from two materials.—I. G. Farbenindustrie. (Germany, July 9, '38.) 19818.

VITAMIN PREPARATIONS.—I. G. Farbenindustrie. (Germany, July 11, '38.) (Germany, Nov. 22, '38.) 19821, 19822.

METHOD OF PROTECTING IRON SURFACES from corrosion by aggressive waters.—I. G. Farbenindustrie. (Germany, July 8, '38.) (Germany, July 15, '38.) 19971, 19972.

PREPARATION OF PHOSPHORESCENT SUBSTANCES.—I. G. Farbenindustrie. (Germany, July 18, '38.) 20057.

INFLAMMABLE PAINT, ETC.—P. Leach. 20316.

REFINING OF OILS AND FATS.—Lever Bros. & Unilever, Ltd. (United States, Sept. 30, '38.) 20129.

PROCESS FOR THE EXTRACTION of the valuable contents from antimonial, etc., ores.—P. F. Loring. (Union of South Africa, July 12, '38.) (Union of South Africa, Sept. 14, '38.) 20289, 20290.

MANUFACTURE OF PHENYL-ISOPROPYLENE-DIAMINE, ETC.—P. May (Soc. des Usines Chimiques Rhone-Poulenc). 19878.

THERAPEUTICALLY VALUABLE PHENANTHRENE DERIVATIVES.—P. May. 19879.

MANUFACTURE OF TRIMETHYLENE TRINITRAMINE.—J. Meissner. 19889.

METHOD OF RE-REFINING used lubricating oil.—S. Bramley-Moore and Bramley-Moore, Ltd 20188.

PREPARATION OF COMPOUNDS of molybdic acid with alkaline earth metals in lump form.—Norddeutsche Chemische Fabrik in Harburg. (Germany, July 14, '38.) (Germany, Nov. 1, '38.) (Germany, Nov. 2, '38.) 19800, 19801, 19802.

PREPARATIONS OF CHEMICALS by the use of ion-exchanging organic resinous bodies.—Ocean Salts (Products), Ltd., and B. A. Adams. 20054.

PROCESS FOR THE DISPOSAL of waste pickle liquor.—P. Parrish. 19754.

METHOD OF DIOLYSIS, ETC.—Pfaudler Co. (United States, July 13, '38.) 19831.

TREATMENT OF METALS.—Projectile & Engineering Co., Ltd., and W. Bridges. 20291.

CONSTRUCTION OF VATS, etc., of lead, etc.—M. L. Reimbert. (France, July 12, '38.) 20343.

MANUFACTURE OF ACYL AMINO ACIDS, ETC.—F. A. Robinson, B. A. Hems, G. L. Rusby and Glaxo Laboratories, Ltd. 19985.

MANUFACTURE OF DINITRILE.—J. D. Rose and Imperial Chemical Industries, Ltd. 20337.

PROCESS FOR OBTAINING CRYSTALLINE material from tar oils.—Rutgerswerke-Akt.-Ges. (Germany, July 30, '38.) 19739.

PROCESSES FOR THE PRODUCTION of carbon disulphide.—Saurefabrik Schweizerhall. (Germany, July 21, '38.) 20078.

CASTING OF ALUMINIUM SILICON ALLOYS.—Silumin-Ges. (Germany, Dec. 7, '38.) 20107.

CASTING OF ALUMINIUM SILICON ALLOYS.—Silumin-Ges. (Italy, Feb. 17.) 20215.

TREATMENT OF HYDROCARBON VAPOURS.—A. H. Stevens (Gray Processes Corporation). 20052.

COATING COMPOSITION.—Stoner-Mudge, Inc. (United States, July 28, '38.) 19691.

FAT PREPARATION, ETC.—E. Strauss. (Germany, July 6, '38.) 19643.

FAT PRODUCTS ENRICHED IN VITAMINS, ETC.—E. Strauss. (Germany, July 6, '38.) 19644.

MANUFACTURE OF FIREPROOF PLASTER, ETC.—J. J. A. Talbot. 20068.

PRODUCTION OF COATING COMPOSITIONS.—W. J. Tennant (Armour & Co.). 19859, 19958.

PRODUCTION OF SOAP COMPOSITIONS.—W. J. Tennant (Armour & Co.). 19959.

TREATMENT OF FATTY ACID MATERIALS.—W. J. Tennant (Armour & Co.). 20361.

MANUFACTURE OF INTERMEDIATES for use in the production of physiologically active substances.—W. J. Tennant (Research Corporation). 20278.

PROCESS OF PROTECTING zinc alloys from corrosion.—W. H. A. Thiemann (Metallges Akt.-Ges.). 20096.

MANUFACTURE OF PHARMACOLOGICAL, etc., preparations.—D. Thomson. 20359.

MANUFACTURE OF CARBONIC ACID ESTERS of aliphatic glycol ethers.—A. Wacker Ges. für Elektrochemische Industrie Ges. (Germany, July 12, '38.) 20039.

MANUFACTURE OF POLYETHINES, ETC.—A. Wacker Ges. für Elektrochemische Industrie Ges. (Germany, July 13, '38.) 20305.

PREPARATION OF HEXAMINE-INSULIN compounds, etc.—R. A. Warburton. (United States, July 15, '38.) 20300.

ART OF HYDRATING CELLULOSIC fibrous material.—R. & W. Watson, Ltd., J. H. Watson and H. E. Anderson. 20126.

Complete Specifications Open to Public Inspection

STEEL ALLOYS.—General Motors Corporation. Jan. 6, 1938. 31214/38.

PROCESS FOR THE TREATMENT OF MIXTURES of urea, water, carbon dioxide, and ammonia, produced in the course of the manufacture of urea.—Compagnie de Produits Chimiques et Electrometallurgiques Alais, Froges, et Camargue. Jan. 6, 1938. 35167/38.

POCESS FOR MANUFACTURING DICARBOXYLIC ACID ANHYDRIDES and dicarboxylic acids.—Naamlooze Vennootschap de Bataafsche Petroleum Maatschappij. Jan. 4, 1938. 36724/38.

PROCESS FOR THE MANUFACTURE of concentrated aqueous solutions of medicinal substances difficultly soluble or insoluble in water.—F. Hoffman-La Roche & Co. Akt.-Ges. Jan. 10, 1938. 36727/38.

PROCESS FOR RECOVERING THORIUM from substances containing thorium and iron.—Ruhrchemie Akt.-Ges. Jan. 7, 1938. 37085/38.

PROCESS FOR THE TREATMENT OF HALOGENATED ORGANIC COMPOUNDS.—Naamlooze Vennootschap de Bataafsche Petroleum Maatschappij. Jan. 10, 1938. 37200/38.

PROCESS FOR REMOVING SALTS FROM WATER.—I. G. Farbenindustrie. Jan. 5, 1938. 37425/38.

REMOVAL OF ALUMINIUM AS AN IMPURITY from tin-containing metals or alloys, such as lead-tin alloys.—National Lead Co. Jan. 4, 1938. 37860/38.

PRODUCTION OF METALLIC BODIES.—Deutsche Gold-Und Silber-Scheideanstalt Vorm. Roessler. Jan. 4, 1938. 37897/38.

PROCESS OF TREATING CELLULAR MATTER.—Institutum Divi Thomae Foundation. Jan. 10, 1938. 25/39.

DETERGENT COMPOSITIONS.—Monsanto Chemical Co. Jan 5, 1938. 91/39.

PROCESS FOR THE PURIFICATION OF METAL-SALT SOLUTIONS.—I. G. Farbenindustrie. Jan. 8, 1938. 134/39.

PROCESS FOR OBTAINING OILS OF LOW POUR-POINT.—Aktiebolaget Separator-Nobel. Jan. 4, 1938. 269/39.

RECOVERY OF POLYNUCLEAR COMPOUNDS.—I. G. Farbenindustrie. Jan. 6, 1938. 283/39.

PROCESSES AND APPARATUS FOR THE PRODUCTION of tungsten carbide and like alloys.—Fides Ges. Fur Die Verwaltung Und Verwertung Von Gewerblichen Schutzrechten. Jan. 5, 1938. 413/39.

VULCANISATION OF RUBBER.—Patentverwertungs-Ges. Hermes. Jan. 5, 1938. 414/39.

MANUFACTURE OF CELLULOSIC MATERIALS.—British Cellophane, Ltd. Jan. 8, 1938. 422/39.

PROCESS FOR THE MANUFACTURE OF CREOSOTE from fluid coal in the cold condition.—J. Jenet. Jan. 8, 1938. 688/39.

DYEING CELLULOSE ESTERS.—Compagnie Nationale de Matieres Colorantes et Manufactures de Produits Chimiques du Nord Reunies Etablissements Kuhlmann. Jan. 10, 1938. 762/39.

Specifications Accepted with Date of Application

PROCESS FOR THE MANUFACTURE OF COMPOUNDS of the cyclopentano-polyhydrophenanthrene series.—Schering Akt.-Ges. Sept. 29, 1936. (Samples furnished.) 508,576.

GLUTAMIC ACID RECOVERY FROM SOLUTIONS.—Standard Brands, Inc. Oct. 15, 1936. 508,841.

PRODUCTION OF GLUTAMIC ACID AND ITS SALTS.—Standard Brands, Inc. Oct. 15, 1936. 508,842.

PREPARATION OF ARTIFICIAL SILK, ARTIFICIAL SPUN FIBRES, horse-hair, bands, films, and the like from phospho-proteins or conjugated proteins.—E. Potter (Akt.-Ges. für Vermogensverwertung). Nov. 26, 1937. 508,781.

MANUFACTURE OF FILAMENTS, SHEETS, FILMS, and the like, of regenerated cellulose.—Atlas Powder Co. March 13, 1937. 508,682.

MEANS FOR THE DESTRUCTIVE DISTILLATION or partial carbonisation of materials carbonisable at low temperatures.—D. Kainscop. Dec. 1, 1937. 508,782.

MANUFACTURE AND PRODUCTION OF BUTANEDIOL-1.4, and its derivatives containing two hydroxy groups.—G. W. Johnson (I. G. Farbenindustrie). Dec. 24, 1937. 508,944.

METHOD OF AND APPARATUS FOR SEPARATING GASEOUS MIXTURES into their constituents by liquefaction.—I. H. Levin. Dec. 28, 1937. 508,685.

SEPARATION OF OILS FROM MIXTURES of the same with solid substances.—G. W. Johnson (I. G. Farbenindustrie). Jan. 3, 1938. 508,849.

PRODUCTION OF SHAPED ARTICLES FROM POLYVINYL CHLORIDE.—W. W. Groves (I. G. Farbenindustrie). Jan. 4, 1938. 508,851.

MANUFACTURE OF CHLOROMETHYL COMPOUNDS of sulphonamides. W. W. Groves (I. G. Farbenindustrie.) Jan. 4, 1938. 508,794.

MANUFACTURE OF DYESTUFFS OF THE TRIARYL METHANE SERIES.—W. W. Groves (I. G. Farbenindustrie). Jan. 5, 1938. (Addition to 472,757.) 508,856.

MANUFACTURE OF CONDENSATION PRODUCTS OF SULPHONIC ACID AMIDES.—W. W. Groves (I. G. Farbenindustrie). Jan. 5, 1938. 508,801.

MANUFACTURE OF COLOURED CONDENSATION PRODUCTS.—Soc. of Chemical Industry in Basle. Jan. 9, 1937. 508,803.

MANUFACTURE OF COMPOUNDS OF THE CYCLOPENTANOPOLYHYDROPHENANTHRENE SERIES.—W. W. Groves (I. G. Farbenindustrie). Jan. 5, 1938. 508,804.

MANUFACTURE OF POLYMERIC BASIC COMPOUNDS.—W. W. Groves (I. G. Farbenindustrie). Jan. 6, 1938. 509,012.

WATER-RESISTANT PROPERTIES OF TEXTILE MATERIALS.—Courtaulds, Ltd., and E. H. Sharples. Dec. 2, 1938. 508,701.

MAKING PIGMENTS.—Interchemical Corporation. Jan. 21, 1937. 508,583.

RECOVERY OF SULPHUR FROM USED GAS-PURIFYING MASSES.—Dr. A. Wacker Ges. Fur Elektrochemische Industrie Ges. Jan 9, 1937. 508,966.

MANUFACTURE OF IRON OR IRON ALLOYS.—I. G. Farbenindustrie. Jan. 11, 1937. 509,024.

ALUMINIUM ALLOYS.—W. H. A. Thiemann (I. G. Farbenindustrie). Jan. 10, 1938. 508,975.

MANUFACTURE AND PRODUCTION OF ANTHRAQUINONE DERIVATIVES.—G. W. Johnson (I. G. Farbenindustrie). Jan. 14, 1938. 508,708.

ALLOY STEELS.—W. H. Hatfield and J. F. Bridge. Jan. 17, 1938. 508,710.

METHOD OF TREATING SEAWEED FOR THE RECOVERY of iodine and other useful products therefrom.—T. Dillon, D. T. Flood, V. C. Barry and P. O'Muineacain. May 5, 1937. 508,715.

TANNING WITH TANNING AGENTS CONTAINING ALUMINIUM.—G. W. Johnson (I. G. Farbenindustrie). Jan. 21, 1938. (Convention date not granted.) 508,716.

SEPARATION OF CARBON BLACK FROM GASES.—G. W. Johnson (I. G. Farbenindustrie). Jan. 27, 1938. 508,594.

INSULIN PREPARATION.—Burroughs Wellcome & Co. (U.S.A.), Inc. Feb. 1, 1937. 508,983.

PRODUCTION OF PROTECTIVE LAYERS ON ALUMINIUM or aluminium alloys and magnesium or magnesium alloys.—Magnesium Elektron, Ltd. Feb. 25, 1937. 508,723.

PROCESS FOR THE MANUFACTURE of β-alkyl-substituted ethylamine derivatives.—Schering Akt.-Ges. Feb. 26, 1937. 508,726.

PRODUCTION OF LEAD ALLOYS.—Pirelli-General Cable Works, Ltd., and G. Martinez. March 1, 1938. 508,604.

MANUFACTURE OF CEMENT.—Soc. Anon des Ciments de Thieu, and L. Blondiau. April 17, 1937. 508,736.

MANUFACTURE OF WATER GAS AND APPARATUS THEREFOR.—Humphreys & Glasgow, Ltd., and J. H. Smith. May 2, 1938. 508,617.

MANUFACTURE OF WATER GAS.—Humphreys & Glasgow, Ltd., and J. H. Smith. May 2, 1938. 508,618.

CORROSION-RESISTANT STEEL ALLOYS.—F. Krupp Akt.-Ges. May 7, 1937. 508,619.

DESTRUCTIVE HYDROGENATION OF SOLID CARBONACEOUS MATERIALS.—International Hydrogenation Patents Co., Ltd., S. Kiesskalt and K. Winnacker. May 24,1938. 508,813.

ELECTROLYTIC PRODUCTION OF METALLIC MAGNESIUM.—H. Suzuki. May 27, 1938. 508,814.

PREPARATION OF ALUMINIUM OXIDES.—C. Toniolo and Azogeno Soc. Anon. June 24, 1938. 508,911.

PREPARATION OF WATER-SOLUBLE DYESTUFFS OF THE ANTHRAQUINONE SERIES.—Chemical Works, formerly Sandoz. July 13, 1937. 508,742.

MANUFACTURE OF MOTOR FUELS.—Standard Oil Development Co. Nov. 19, 1937. 508,913.

MANUFACTURE OF COATED CELLULOSE HYDRATE SHEETS AND FILMS.—British Cellophane, Ltd. Aug. 23, 1937. 508,822.

PRODUCTION OF AMINES.—T. H. Temmler (trading as Temmler-Werke Vereinigte Chemische Fabriken H. Temmler). March 30, 1938. 508,756.

PRODUCTION OF OPTICALLY ACTIVE PHENYLISOPROPYLAMINES.—T. H. Temmler (trading as Temmler-Werke Vereinigte Chemische Fabriken H. Temmler). June 1, 1938. 508,757.

MANUFACTURE AND PRODUCTION OF BUTADIENE FROM BUTANE.—I. G. Farbenindustrie. Oct. 20, 1937. 508,764.

REGENERATED VULCANISED RUBBER.—Soc. Hydro-Electrique & Industrielle du Morvan. Nov. 23, 1937. 508,829.

PREPARATION OF ALKALI CELLULOSATES AND CELLULOSE ETHERS.—W. J. Tennant (Dow Chemical Co.). Oct. 21, 1938. 508,766.

PRODUCTION OF PHOSPHATE FERTILISERS.—Rochling'sche Eisen-Und Stahlmerke Ges. Oct. 23, 1937. 508,830.

GLUTAMIC ACID RECOVERY FROM SOLUTIONS.—Standard Brands, Inc. Oct. 15, 1936. 508,927.

PRODUCTION OF MAGNESIUM.—Magnesium Elektron, Ltd. Jan. 24, 1938. 508,647.

INSECTICIDAL AND FUNGICIDAL COMPOSITIONS.—W. J. Tennant (Dow Chemical Co.). Nov. 25, 1938. 508,768.

DEPRESSION OF CARBONACEOUS MATERIAL IN FLOTATION.—American Cyanamid Co. Feb. 1, 1938. 508,929.

PRODUCTION OF SINTERED HARD ALLOYS.—Tool Metal Manufacturing Co., Ltd. Jan. 11, 1938. 508,662.

MANUFACTURE OF STYRENE.—Consortium Fur Elektrochemische Industrie Ges. Feb. 2, 1938. 508,666.

Books Received

May's Chemistry of Synthetic Drugs. By Percy May and G. Malcolm Dyson. London: Longman's, Green and Co. Pp. 370. 21s.

Calculations of Quantitative Chemical Analysis. By L. F. Hamilton, and S. G. Simpson. 3rd edition. New York: McGraw-Hill Publishing Co. London: McGraw-Hill Publishing Co. Pp. 293. 15s.

Company News

Viscose Development Co., Ltd., have announced an interim dividend of 3 per cent., less tax, on ordinary and preference shares. (Last year first and final 7 per cent. on ordinary).

E. I. du Pont du Nemours and Co. have issued a preliminary report giving net earnings for the June quarter at $1.72 per share, against 71c. for the same quarter of last year.

British Celilynd, Ltd., report to May 31, trading loss £1,157 (£4,512); total loss £2,844. After crediting reserve against loss on forward contracts written back £350 and fees £22, loss subject to depreciation on plant and machinery, £2,472 (loss £28,689, increasing debit to £40,665, which was written off in accordance with capital reduction scheme of October last).

Beechams Pills, Ltd.—Negotiations have been completed for the purchase by Beechams Pills, Ltd., of the County Perfumery Co., owners of the Brylcream business. The purchase price is nearly £600,000, and is to be met by the issue of 600,000 £1 5½ per cent. preference shares of Beecham Maclean Holdings, the £2,250,000 subsidiary company of Beechams Pills.

Stewarts and Lloyds, Ltd.—Terms for an amalgamation of Stanton Ironworks with Stewarts and Lloyds have been provisionally settled by the boards of the two companies. Holders of Stanton 6 per cent. preference stock are to be offered an equal amount of Stewarts and Lloyds 6 per cent. first preference stock, while for every £1 unit of Stanton ordinary stock holders will be offered one £1 unit of Stewarts and Lloyds deferred stock, plus 12s. 6d. to be satisfied partially in 5 per cent. third preference stock of Stewarts and Lloyds (taken at the present market value of 22s. per £1 unit) and partly in cash. The proposals are subject to acceptance by holders of not less than 90 per cent. of each class of stock (or such smaller proportion as Stewarts and Lloyds accept).

New Companies Registered

Tyne Chemical Company, Ltd. 353,978.—Private company. Capital £6,000 in 6,000 shares of £1 each. To carry on business as manufacturers, exporters and importers of and dealers in chemicals, gases, drugs, medicines, etc. Directors: Nander Bernstein, County Hotel, Newcastle-on-Tyne; Laszlo Tordai, Zoltan Dobai, Stanley Holmes.

Landore Chemical Co., Ltd. 354,332.—Private company. Capital £1,500 in 1,500 ordinary shares of £1 each. To acquire the business of manufacturing chemists and fertiliser merchants carried on by The South Wales Chemical Co., at Millbrook Works, Landore, Swansea. Directors: Geo. Grant, Gamrie, Crymlyn Road, Skewen, Glam.; Mrs. Gertrude M. Grant.

Commercial Intelligence

The following are taken from printed reports, but we cannot be responsible for errors that may occur.

Mortgages and Charges

(Note.—The Companies Consolidation Act of 1908 provides that every Mortgage or Charge, as described therein, shall be registered within 21 days after its creation, otherwise it shall be void against the liquidator and any creditor. The Act also provides that every company shall, in making its Annual Summary, specify the total amount of debt due from the company in respect of all Mortgages or Charges. The following Mortgages and Charges have been so registered. In each case the total debt, as specified in the last available Annual Summary, is also given—marked with an *—followed by the date of the Summary, but such total may have been reduced.)

LONDON & LANCASHIRE CHEMICAL CO., LTD., Manchester. (M., 22/7/39.) July 11, series of £1,500 debentures, present issue £1,000; general charge.

UNITED KINGDOM GAS CORPORATION, LTD., London, E.C. (M., 22/7/39.) July 5, £15,000 and £8,500 debenture stock, parts of an amount already registered. *£1,108,046. May 25, 1939.

WALKDEN SOAP & CHEMICAL CO., LTD., Manchester. (M., 22/7/39.) July 6, £120 debenture, to A. Aboudi, Manchester; general charge.

Company Winding-up Voluntarily

CHANCE & HUNT, LTD. (C.W.U.V., 22/7/39.) June 30 (members). H. Wall, Chance & Hunt Works, Oldbury, liquidator.

Chemical Trade Inquiries

The following trade inquiries are abstracted from the "Board of Trade Journal." Names and addresses may be obtained from the Department of Overseas Trade (Development and Intelligence), 35 Old Queen Street, London, S.W.1 (quote reference number).

Australia.—A newly established firm of agents at Perth wishes to obtain the representation of United Kingdom manufacturers of plastics, medicines and cosmetics for Western Australia, also Victoria if desired. (Ref. No. 552.)

Hungary.—A newly established agent at Budapest wishes to obtain the representation of United Kingdom manufacturers of dyes (including aniline), colours and paints. (Ref. No. 576.)

Chemical and Allied Stocks and Shares

SINCE the beginning of the new Stock Exchange account a small improvement in business in the stock and share markets has been reported, due to more reassuring views of the international situation and the rally shown by Wall Street markets at the beginning of the week.

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Movements in securities of chemical and allied companies were small and relatively unimportant, but in most cases they were in favour of holders. Fison Packard have been more active and on balance have improved from 40s. 6d. to 41s. 3d., aided by market hopes that a moderately larger dividend may be in prospect. Borax Consolidated deferred were also better and have improved from 19s. 9d. to 20s. 7½d., while B. Laporte were well maintained at 58s. On the other hand, British Oil & Cake Mills preferred were lower at 39s. 6d. compared with 40s. 3d. a week ago, although Lever & Unilever improved from 33s. 3d. to 34s. British Match were a firm feature at 34s., while Reckitt & Sons were steady around 100s.

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Distillers were steady at 94s. 6d. in advance of the annual meeting, and United Molasses at 24s. 4½d. were higher on the week, while slightly better prices ruled for British Oxygen, British Aluminium, Murex, Turner & Newall and various other widely-held shares. Iron and steel securities showed a firmer tendency, attention being drawn to the generous yields offered and also to the excellent steel and pig iron production figures for the past month. Dorman Long, Consett Iron and Guest Keen were inclined to improve, while there was a sharp rise in Stanton Iron on the terms of the proposed merger with Stewarts & Lloyds. Staveley Coal & Iron responded to the current market view that, despite the reduction made in the interim payment, the total dividend may be 10 per cent. tax free. Richard Thomas shares and debentures were virtually unchanged awaiting the results and the statements at the annual meeting. Babcock & Wilcox, Whitehead Iron, Hopkinsons and Tube Investments were among shares which had a firmer appearance this week, but movements in prices were small. Barrow Hematite rose sharply to 11s. on the reported agreement with Colvilles, the Scottish steel company. Metal Box were higher at 71s. 3d., while Triplex Glass were better around 37s. 6d. aided by market hopes that the dividend may be maintained at 25 per cent. United Glass Bottle and other glass manufacturers' shares were inactive. General Refractories were little changed at 7s. 4½d. Elsewhere Neepsend Steel & Tool were higher in advance of the dividend announcement.

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Courtaulds were higher at 28s. 4½d. having remained under the influence of the raising of the interim dividend from 1½ per cent. to 2 per cent., which had not been generally anticipated in the market. British Celanese issues were better, as were Lansil ordinary and the shares of various other rayon companies. Among cotton textile shares Bradford Dyers and Calico Printers were moderately better.

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Imperial Chemical were unchanged on balance at 28s. 6d. and the preference units were 28s. 9d., while Lawes Chemical shares were maintained at 7s. 6d. Low Temperature Carbonisation 2s. units have remained at 1s. 4½d., while British Industrial Plastics were 1s. 6d. British Plaster Board at 29s. 4½d. held their recent rise, aided by the view that the bonus proposals may be announced shortly. Associated Cement rallied to 67s. 6d., but Pinchin Johnson were little changed at 22s. 1½d., and International Paint went back from 80s. to 78s. 9d. Wall Paper deferred were 25s. Barry & Staines were lower at 31s. 9d., and following the deduction of the interim dividend from the price, Michael Nairn were quoted at 53s. 1½d. British Glues were unchanged at 4s. 9d., while Monsanto Chemicals 5½ per cent. preference shares were again 21s. 10½d.

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In other directions Boots Drug were steady and unchanged at 40s. 6d., as were British Drug Houses at 21s. 3d., Sangers at 20s. 3d., and Timothy Whites & Taylors at 22s. 1½d. Oil shares were inactive, but subsequently Anglo-Iranian and "Shell" showed a better tendency.

Weekly Prices of British Chemical Products

CONDITIONS in the general chemical market are somewhat brighter this week, the volume of inquiry both for home and export showing a decided improvement. The demand too is fairly well spread over most sections of the market and is not merely restricted to items in regular call. A good seasonal inquiry for cream of tartar and tartaric acid is reported and there is also a renewed interest in solvents. The main consuming industries are calling up their existing contract commitments with reasonable promptness and a number of new bookings have been reported covering deliveries up to the end of the year. There are no outstanding price changes to record and in the majority of cases quotations are steady with a firm undertone. In the coal tar section business continues to be rather hesitant with both buyers and sellers marking time. Values remain steady although in the absence of any substantial transactions quoted prices can only be regarded as nominal. A little interest has been displayed in cresylic acid, toluol and xylol.

Price Changes

Rises: Naphthalene, crude, whizzed or hot pressed; Diphenylamine.

Falls: Benzoic Acid, 1914 B.P. (ex toluol).

MANCHESTER.—Holiday influences continue to leave their mark on the Manchester chemical market, in respect both of fresh bookings and of the movement into consumption against contracts. This seasonal influence, however, is no more pronounced than it normally is and, on the whole, trading concerns are fairly satisfactory. Buying interest in most of the leading "heavies" has been on a moderate scale, and fair aggregate quantities are being called for against existing commitments, with a further improving tendency noticeable in the demand for textile chemicals of various kinds from the Lancashire and Yorkshire areas. The majority of prices are on a steady basis. Light tar products are meeting with a fair demand and values are maintained.

GLASGOW.—Business in general chemicals has been rather quiet during the week on account of the annual Glasgow holidays. Prices, however, continue firm at about previous figures, with no important changes to report.

General Chemicals

ACETONE.—£39 to £43 per ton, according to quantity.

ACETIC ACID.—Tech., 80%, £30 5s. per ton; pure 80%, £32 5s.; tech., 40%, £15 12s. 6d. to £18 12s. 6d.; tech., 60%, £23 10s. to £25 10s. MANCHESTER: 80%, commercial, £30 5s.; tech., glacial, £42 to £46.

ALUM.—Loose lump, £8 7s. 6d. per ton d/d; GLASGOW: Ground, £10 7s. 6d. per ton; lump, £9 17s. 6d.

ALUMINIUM SULPHATE.—£7 5s. 0d. per ton d/d Lancs.

AMMONIA, ANHYDROUS.—Spot, 1s. to 1s. 1d. per lb. d/d in cylinders.

AMMONIUM CARBONATE.—£20 per ton d/d in 5 cwt. casks.

AMMONIUM CHLORIDE (see Salammoniac).—Firsts, lump, spot, £42 17s. 6d. per ton; d/d address in barrels. Dog-tooth crystals, £35 per ton; fine white crystals, £18 per ton, in casks, ex store. GLASGOW: Large crystals, in casks, £37 10s.

AMMONIUM DICHROMATE.—8¼d. per lb. d/d U.K.

ANTIMONY OXIDE.—£68 per ton.

ARSENIC.—Continental material £10 10s. per ton c.i.f., U.K. ports; Cornish White, £12 5s. to £12 10s. per ton f.o.r., mines, according to quantity. MANCHESTER: White powdered Cornish, £15 10s. per ton, ex store.

BARIUM CHLORIDE.—£11 10s. to £12 10s. per ton in casks ex store. GLASGOW: £12 per ton.

BLEACHING POWDER.—Spot, 35/37%, £9 5s. per ton in casks, special terms for contract. GLASGOW: £9 5s. per ton net ex store.

BORAX COMMERCIAL.—Granulated, £16 per ton; crystal, £17; powdered, £17 10s.; extra finely powdered, £18 10s., packed in 1-cwt. bags, carriage paid home to buyers' premises within the United Kingdom in 1-ton lots. GLASGOW: Granulated, £16 per ton in 1-cwt. bags. carriage paid.

BORIC ACID.—Commercial granulated, £28 10s. per ton; crystal, £29 10s.; powdered, £30 10s.; extra finely powdered, £32 10s. in 1-cwt. bags, carriage paid home to buyers' premises within the United Kingdom in 1-ton lots. GLASGOW: Crystals, £29 10s.; powdered, £30 10s. 1-cwt. bags in 1-ton lots.

CALCIUM BISULPHITE.—£6 10s. per ton f.o.r. London.

CALCIUM CHLORIDE.—GLASGOW: 70/75% solid, £5 12s. 6d. per ton ex store.

CHARCOAL, LUMP.—£6 to £6 10s. per ton, ex wharf. Granulated, £7 to £9 per ton according to grade and locality.

CHLORINE, LIQUID.—£18 15s. per ton, seller's tank wagons, carriage paid to buyer's sidings; £19 5s. per ton, d/d in 16/17 cwt. drums (3-drum lots); £19 10s. per ton d/d in 10-cwt. drums (4-drum lots); 4⅝d. per lb. d/d station in single 70-lb. cylinders.

CHROMETAN.—Crystals, 2⅝d. per lb.; liquor, £13 per ton d/d station in drums.

CHROMIC ACID.—9d. per lb., less 2½%; d/d U.K.

CHROMIC OXIDE.—11½d. per lb.; d/d U.K.

CITRIC ACID.—1s. 0¼d. per lb. MANCHESTER: 1s. 0¼d. GLASGOW: B.P. crystals, 1s. 0¼d. per lb; less 5%, ex store.

COPPER SULPHATE.—£18 5s. per ton, less 2% in bags. MANCHESTER: £18 12s. 6d. per ton f.o.b. GLASGOW: £19 10s. per ton, less 5%, Liverpool in casks.

CREAM OF TARTAR.—100%, £4 12s. per cwt., less 2½%. GLASGOW: 99%, £4 12s. per cwt. in 5-cwt. casks.

FORMALDEHYDE.—£20-£22 per ton.

FORMIC ACID.—85%, in carboys, ton lots, £42 to £47 per ton.

GLYCERINE.—Chemically pure, double distilled, 1,260 s.g., in tins, £3 10s. to £4 10s. per cwt. according to quantity; in drums, £3 2s. 6d. to £3 16s. 0d. Refined pale straw industrial, 5s. per cwt. less than chemically pure.

HYDROCHLORIC ACID.—Spot, 5s. 6d. to 8s. carboy d/d according to purity, strength and locality.

IODINE.—Resublimed B.P., 6s. 9d. per lb. in 7 lb. lots.

LACTIC ACID.—(Not less than ton lots). Dark tech., 50% by vol., £24 10s. per ton; 50% by weight, £28 10s.; 80% by weight, £50; pale tech., 50% by vol., £28; 50% by weight, £33; 80% by weight, £55; edible, 50%, by vol., £41. One ton lots ex works, barrels free.

LEAD ACETATE.—LONDON: White, £31 10s. ton lots; brown, £35. MANCHESTER: White, £31; brown, £30. GLASGOW: White crystals, £29 10s.; brown, £1 per ton less.

LEAD NITRATE.—£27 per ton for 1-ton lots.

LEAD, RED.—£30 15s. 0d. 10 cwt. to 1 ton, less 2½% carriage paid. GLASGOW: £30 per ton, less 2½% carriage paid for 2-ton lots.

LITHARGE.—GLASGOW: Ground, £30 per ton, less 2½%, carriage paid for 2-ton lots.

MAGNESITE.—Calcined, in bags, ex works, about £8 per ton.

MAGNESIUM CHLORIDE.—Solid (ex wharf) £5 10s. per ton. GLASGOW: £7 5s. per ton.

MAGNESIUM SULPHATE.—Commercial, £5 10s. per ton, ex wharf.

MERCURY PRODUCTS.—Ammoniated B.P. (white precip.), lump, 6s. 5d. per lb.; powder B.P., 6s. 7d.; bichloride B.P. (corros. sub.), 5s. 8d.; powder B.P., 5s. 4d.; chloride B.P. (calomel), 6s. 5d.; red oxide cryst. (red precip.), 7s. 6d.; levig, 6s. 9d.; yellow oxide B.P. 6s. 10d.; persulphate white B.P.C., 6s. 7d.; sulphide black (hyd. sulph. cum. sulph. 50%), 6s. 6d. For quantities under 112 lb., 1d. extra; under 28 lb., 5d. extra.

METHYLATED SPIRIT.—61 O.P. industrial, 1s. 5d. to 2s. per gal.; pyridinised industrial, 1s. 7d. to 2s. 2d.; mineralised, 2s. 6d. to 3s. Spirit 64 O.P. is 1d. more in all cases and the range of prices is according to quantities.

NITRIC ACID.—Spot, £25 to £30 per ton according to strength, quantity and destination.

OXALIC ACID.—£48 15s. to £57 10s. per ton, according to packages and position. MANCHESTER: £49 to £55 per ton ex store. GLASGOW: £2 9s. per cwt. in casks.

PARAFFIN WAX.—GLASGOW: 3¾d. per lb.

POTASH, CAUSTIC.—Solid, £33 5s. to £38 per ton according to quantity, ex store; broken, £40 per ton. MANCHESTER: £38.

POTASSIUM CHLORATE.—£36 7s. 6d. per ton. MANCHESTER: £37 per ton. GLASGOW: 4¼d. per lb.

POTASSIUM DICHROMATE.—5¼d. per lb. carriage paid. GLASGOW: 5¼d. per lb., net, carriage paid.

POTASSIUM CHROMATE.—7d. per lb., d/d U.K.

POTASSIUM IODIDE.—B.P. 6s. 3d. per lb. in 7 lb. lots.

POTASSIUM NITRATE.—Small granular crystals, £24 to £27 per ton ex store, according to quantity.

POTASSIUM PERMANGANATE.—LONDON: 9¼d to 10½d. per lb. MANCHESTER: B.P. 9½d. to 11½d. GLASGOW: B.P. Crystals, 10½d.

POTASSIUM PRUSSIATE.—5¼d. to 6d. per lb. MANCHESTER: Yellow, 6d. to 6¼d.

PRUSSIATE OF POTASH CRYSTALS.—In casks, 6¾d. per lb. net, ex store.

SALT CAKE.—Unground, spot, £3 8s. 6d. per ton.

SODA ASH.—Light 98/100%, £5 17s. 6d. per ton f.o.r. in bags.

SODA, CAUSTIC.—Solid, 76/77° spot, £13 10s. per ton d/d station.

SODA CRYSTALS.—Spot, £5 to £5 5s. per ton d/d station or ex depot in 2-cwt. bags.

SODIUM ACETATE.—£19-£20 per ton carriage paid North. GLASGOW: £18 10s. per ton net ex store.

SODIUM BICARBONATE.—Refined spot, £10 10s. per ton d/d station in bags in 1-ton lots. MANCHESTER: £10 15s. GLASGOW: £13 5s. per ton in 1 cwt. kegs, £11 5s. per ton in 2-cwt. bags.

SODIUM BISULPHITE POWDER.—60/62%, £12 10s. to £14 per ton d/d in 2-ton lots for home trade.

SODIUM CARBONATE MONOHYDRATE.—£20 per ton d/d in minimum ton lots in 2 cwt. free bags.
SODIUM CHLORATE.—£27 10s. to £32 per ton. GLASGOW: £1 11s. per cwt., minimum 3 cwt. lots.
SODIUM DICHROMATE.—Crystals cake and powder 4¼d. per lb. net d/d U.K. with rebates for contracts. GLASGOW: 4¼d. per lb., carriage paid.
SODIUM CHROMATE.—4½d. per lb. d/d U.K.
SODIUM HYPOSULPHITE.—Pea crystals, £15 5s. per ton for 2-ton lots; commercial, £11 5s. per ton. MANCHESTER: Commercial, £11; photographic, £15 10s.
SODIUM METASILICATE.—£14 5s. per ton, d/d U.K. in cwt. bags.
SODIUM NITRATE.—Refined, £8 5s. per ton for 6-ton lots d/d. GLASGOW: £1 12s. per cwt. in 1-cwt. kegs, net, ex store.
SODIUM NITRITE.—£18 5s. per ton for ton lots.
SODIUM PERBORATE.—10%, £4 per cwt. d/d in 1-cwt. drums.
SODIUM PHOSPHATE.—Di-sodium, £12 per ton delivered for ton lots. Tri-sodium, £16 10s. per ton delivered per ton lots.
SODIUM PRUSSIATE.—4d. per lb. for ton lots. MANCHESTER: 4¼d. to 5d. GLASGOW: 4d.
SODIUM SILICATE.—£8 2s. 6d. per ton.
SODIUM SULPHATE (GLAUBER SALTS).—£3 per ton d/d.
SODIUM SULPHATE (SALT CAKE).—Unground spot, £3 to £3 10s. per ton d/d station in bulk. MANCHESTER: £3 10s.
SODIUM SULPHIDE.—Solid 60/62%, Spot, £11 15s. per ton d/d in drums; crystals, 30/32%, £9 per ton d/d in casks. MANCHESTER: Concentrated solid, 60/62%, £11; commercial, £8 10s.
SODIUM SULPHITE.—Pea crystals, spot, £14 10s. per ton d/d station in kegs.
SULPHUR PRECIP.—B.P., £55 to £60 per ton according to quantity. Commercial, £50 to £55.
SULPHURIC ACID.—168° Tw., £4 11s. to £5 1s. per ton; 140° Tw., arsenic-free, £3 to £3 10s.; 140° Tw., arsenious, £2 10s.
TARTARIC ACID.— 1s. 1¼d. per lb. less 5%, carriage paid for lots of 5 cwt. and upwards. MANCHESTER: 1s. 1¼d. per lb. GLASGOW: 1s. 1½d. per lb., 5%, ex store.
ZINC SULPHATE.—Tech., £11 10s. f.o.r., in 2-cwt. bags.

Rubber Chemicals

ANTIMONY SULPHIDE.—Golden, 7½d. to 1s. 2½d. per lb., according to quality. Crimson, 1s. 6½d. to 1s. 8d. per lb.
ARSENIC SULPHIDE.—Yellow, 1s. 5d. to 1s. 7d. per lb.
BARYTES.—£6 to £6 10s. per ton, according to quality.
CADMIUM SULPHIDE.—3s. 1d. to 3s. 4d. per lb.
CARBON BLACK.—3⅞d. to 4 1/16d. per lb., ex store.
CARBON DISULPHIDE.—£31 to £33 per ton, according to quantity, drums extra.
CARBON TETRACHLORIDE.—£41 to £46 per ton, according to quantity, drums extra.
CHROMIUM OXIDE.—Green, 11½d. per lb.
DIPHENYLGUANIDINE.—2s. 2d. per lb.
INDIA-RUBBER SUBSTITUTES.—White, 4¼d. to 5d. per lb.; dark 3⅜d. to 4⅝d. per lb.
LAMP BLACK.—£24 to £26 per ton del., according to quantity. Vegetable black, £35 per ton upwards.
LEAD HYPOSULPHITE.—9d. per lb.
LITHOPONE.—Spot, 30%, £16 10s. per ton, 2-ton lots d/d in bags.
SULPHUR.—£9 to £9 5s. per ton. SULPHUR PRECIP. B.P., £55 to £60 per ton. SULPHUR PRECIP. COMM., £50 to £55 per ton.
SULPHUR CHLORIDE.—5d. to 7d. per lb., according to quantity.
VERMILION.—Pale, or deep, 5s. per lb., 1-cwt. lots.
ZINC SULPHIDE.—£58 to £60 per ton in casks ex store, smaller quantities up to 1s. per lb.

Nitrogen Fertilisers

AMMONIUM SULPHATE.—The following prices have been announced for neutral quality basis 20.6% nitrogen, in 6-ton lots delivered farmer's nearest station up to June 30, 1939; November, £7 8s.; December, £7 9s. 6d.; January, 1939; £7 11s.; February, £7 12s. 6d.; March/June, £7 14s.
CALCIUM CYANAMIDE.—The following prices are for delivery in 5-ton lots, carriage paid to any railway station in Great Britain up to June 30, 1939; November, £7 12s. 6d.; December, £7 13s. 9d.; January, 1939, £7 15s.; February, £7 16s. 3d;. March, £7 17s. 6d.; April/June, £7 18s. 9d.
NITRO CHALK.—£7 10s. 6d. per ton up to June 30, 1939.
SODIUM NITRATE.—£8 per ton for delivery up to June 30, 1939.
CONCENTRATED COMPLETE FERTILISERS.—£11 4s. to £11 13s. per ton in 6-ton lots to farmer's nearest station.
AMMONIUM PHOSPHATE FERTILISERS.—£10 19s. 6d. to £14 16s. 6d. per ton in 6-ton lots to farmer's nearest station.

Coal Tar Products

BENZOL.—At works, crude, 9½d. to 10d. per gal.; standard motor, 1s. 3½d. to 1s. 4d.; 90%, 1s. 4½d. to 1s. 5d., pure 1s. 8½d. to 1s. 9d. MANCHESTER: Crude, 1s 0¼d. per gal.; pure, 1s. 8d. to 1s. 8½d. per gal.
CARBOLIC ACID.—Crystals, 6¾d. to 7¾d. per lb., small quantities would be dearer; Crude, 60's 1s. 7d. to 1s. 10d.; dehydrated, 2s. 6d. per gal., according to specification; Pale, 99/100%, per lb. f.o.b. in drums; crude, 2s. 1d. per gal.
CREOSOTE.—Home trade, 3⅝d. to 4d. per gal., f.o.r., makers' works; exports 6d. to 6½d. per gal., according to grade. MANCHESTER: 3½d. to 4½d.
CRESYLIC ACID.—97/99%, 1s. 5d. to 1s. 8d.; 99/100%, 2s. to 2s. 6d. per gal., according to specification. MANCHESTER: Pale, 99/100%, 1s. 5d.
NAPHTHA.—Solvent, 90/160, 1s. 6d. to 1s. 7d. per gal.; solvent, 95/160%, 1s. 7d. to 1s. 8d., naked at works; heavy 90/190%, 1s. 1½d. to 1s. 3d. per gal., naked at works, according to quantity. MANCHESTER: 90/160%, 1s. 5d. to 1s. 7½d. per gal.
NAPHTHALENE.—Crude, whizzed or hot pressed, £5-£6 per ton; purified crystals, £9 10s. per ton in 2-cwt. bags. LONDON: Fire lighter quality, £3 to £4 10s. per ton. MANCHESTER: Refined, £10 10s. to £11 10s. 0d. per ton f.o.b.
PITCH.—Medium, soft, 26s. per ton, f.o.b. MANCHESTER: 24s. f.o.b., East Coast.
PYRIDINE.—90/140%, 12s. 6d. to 14s. per gal.; 90/160%, 10s. 6d. to 11s. 6d. per gal.; 90/180%, 3s. to 4s. per gal. f.o.b. MANCHESTER: 10s. 6d. to 14s. per gallon.
TOLUOL.—90%, 2s. 1d. to 2s. 2d. per gal.; pure 2s. 5d. to 2s. 6d. MANCHESTER: Pure, 2s. 5d. per gallon, naked.
XYLOL.—Commercial, 2s. 3d. per gal.; pure, 2s. 5d. MANCHESTER: 2s. 4d. per gallon.

Wood Distillation Products

CALCIUM ACETATE.—Brown, £6 15s. to £9 5s. per ton; grey, £8 to £8 5s. MANCHESTER: Brown, £8; grey, £9 10s.
METHYL ACETONE.—40.50%, £32 to £35 per ton.
WOOD CREOSOTE.—Unrefined, 6d. to 8d. per gal., according to boiling range.
WOOD NAPHTHA, MISCIBLE.— 2s. 8d. to 3s. per gal;. solvent, 3s. to 3s. 5d. per gal.
WOOD TAR.—£3 to £8 per ton, according to quality.

Intermediates and Dyes

ANILINE OIL.—Spot, 8d. per lb., drums extra, d/d buyer's works.
ANILINE SALTS.—Spot, 8d. per lb. d/d buyer's works, casks free.
BENZALDEHYDE.—1s. 10d. per lb., for cwt. lots, net packages.
BENZIDINE, HCl.—2s. 7½d. per lb., 100% as base, in casks.
BENZOIC ACID, 1914 B.P. (ex toluol).—1s. 11d. per lb. d/d buyer's works.
m-CRESOL 98/100%.—1s. 8d. to 1s. 9d. per lb. in ton lots.
o-CRESOL 30/31° C.—6½d. to 7½d. per lb. in 1-ton lots.
p-CRESOL 34/35° C.— 1s. 7d. to 1s. 8d. per lb. in ton lots.
DICHLORANILINE.—2s. 1½d. to 2s. 5½d. per lb.
DIMETHYLANILINE.—Spot, 1s. 7½d. per lb., package extra.
DINITROBENZENE.—7½d. per lb.
DINITROCHLORBENZENE, SOLID.—£79 5s. per ton.
DINITROTOLUENE.—48/50° C., 8½d. per lb.; 66/68° C., 11d.
DIPHENYLAMINE.—Spot, 2s. 3d. per lb.; d/d buyer's works.
GAMMA ACID, Spot, 4s. 4½d. per lb. 100%, d/d buyer's works.
H ACID.—Spot, 2s. 7d. per lb.; 100%, d/d buyer's works.
NAPHTHIONIC ACID.—1s. 10d. per lb.
β-NAPHTHOL.—£97 per ton; flake, £94 8s. per ton.
α-NAPHTHYLAMINE.—Lumps, 1s. 1d. per lb.
β-NAPHTHYLAMINE.—Spot, 3s. per lb.; d/d buyer's works.
NEVILLE AND WINTHER'S ACID.—Spot, 3s. 3½d. per lb. 100%.
o-NITRANILINE.—4s. 3½d. per lb.
m-NITRANILINE.—Spot, 2s. 10d. per lb. d/d buyer's works.
p-NITRANILINE.—Spot, 1s. 10d. to 1s. 11d. per lb. d/d buyer's works.
NITROBENZENE.—Spot, 4½d. to 5d. per lb., in 90-gal. drums, drums extra, 1-ton lots d/d buyer's works.
NITRONAPHTHALENE.—9½d. per lb.; P.G., 1s. 0½d. per lb.
SODIUM NAPHTHIONATE.—Spot, 1s. 11d. per lb.; 100% d/d buyer's works.
SULPHANILIC ACID.—Spot, 8¾d. per lb. 100%, d/d buyer's works.
o-TOLUIDINE.—10½d. per lb., in 8/10 cwt. drums, drums extra.
p-TOLUIDINE.—1s. 10½d. per lb., in casks.
m-XYLIDINE ACETATE.—4s. 3d. per lb., 100%.

Latest Oil Prices

LONDON, July 19.—LINSEED OIL was steadier; spot, £25 15s. per ton (small quantities); Aug., £23 7s. 6d.; Sept.-Dec., £23; Jan.-April, £22 17s. 6d., naked. SOYA BEAN OIL was quiet. Oriental, July-Aug. shipment, c.i.f., bulk, £17 15s. per ton. RAPE OIL was dull. Crude extracted, £31 10s. per ton; technical refined, £32 15s., naked, ex wharf. COTTON OIL was barely steady. Egyptian crude, £17 5s. per ton; refined common edible, £20 15s.; deodorised, £22 15s., naked, ex mill (small lots £1 10s. extra). TURPENTINE was quiet. American, spot, 33s. 3d. per cwt.; Aug. delivery, 32s. 9d.
HULL.—LINSEED OIL, spot, £24 5s. per ton; July, £23 12s. 6d.; Aug., £23 7s. 6d.; Sept.-Dec., £23 5s. COTTON OIL, Egyptian, crude, spot, £17 per ton; edible refined, £20; technical, spot, £20; deodorised, £22, naked. PALM KERNEL OIL, crude, f.m.q.; spot, £17 per ton, naked. GROUNDNUT OIL, extracted, spot, £23 per ton; deodorised, £26. RAPE OIL, extracted, spot, £30 10s. per ton; refined, £31 10s. SOYA OIL, extracted, spot, £25 10s. per ton; deodorised, £28 10s. COD OIL, F.o.r., or f.a.s., 25s. per cwt., in barrels. CASTOR OIL, Pharmaceutical, 39s. 6d. per cwt.; first, 34s. 6d.; second, 32s. 6d.
"NITRO-CHALK."—£7 10s. 6d. per ton up to June 30, 1939.
BENZOIC ACID, 1914 B.P. (ex toluol).—1s. 11d. per lb. d/d

CLASSIFIED SECTION

NOTE : Trade announcements, other than strictly second-hand and job lines, cannot be inserted in these pages except by firms whose advertisements run in the display columns

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CHARCOAL, ANIMAL, and VEGETABLE, horticultural, burning, filtering, disinfecting, medicinal, insulating; also lumps ground and granulated; established 1830; contractors to H.M. Government.—THOS. HILL-JONES, LTD., "Invicta" Mills, Bow Common Lane, London, E. Telegrams, "Hill-Jones, Bochurch, London." Telephone: 3285 East.

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